UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Region 1

REPORTS
Region 1,
Annual BRC
1959

1380 (3000)

WHITE PINE BLISTER RUST CONTROL

Calendar Year 1959

Division of State & Private Forestry

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Missoula, Montana

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This report was prepared under the direction of the Chief of the Division of State & Private Forestry from information furnished by the National Forests, Intermountain Forest and Range Experiment Station, National Park Service and blister rust control units of the Section of Forest Insect and Disease Control.

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Forest Service

Region 1

Division of State & Private Forestry

Section of Insect and Disease Control

Western white pine seed trees remaining after logging in 1957-58. One hundred forty-two acres - slash dozer piled, burned 1958. Western white pine plantation in background planted in 1933.

Western white pine in left front d.b.h. 33"; height 160'; estimated volume 2,090 bd.-ft.

Western white pine in center front d.b.h. 32"; height 165'; estimated volume 2,360 bd.-ft.

Western white pine in right front d.b.h. 26"; height 142'; estimated volume 1,180 bd.-ft.

Hanna Flat - Kalispell Bay, Kaniksu National Forest, 1959.

WHITE PINE BLISTER RUST CONTROL

I. HIGHLIGHTS OF 1959 BLISTER RUST CONTROL PROGRAM

This report covers the three control programs, National Forest, National Parks and State and Private, in Region 1. The Forest Service operating within the provisions of the Lea Act, conducts control operations to protect the white pine on national forest lands, and under cooperative agreements with other agencies, provides leadership and technical direction for all control programs. Operational and project management services are performed as requested by the cooperating agencies.

In Region 1, the administration of the white pine blister rust control program and the Methods Development & Improvement Unit in Spokane, Washington is the responsibility of the Forest Insect and Disease Control Section of the Division of State & Private Forestry. The operation and management of the Northern Idaho Forest Genetics Center at Moscow, Idaho is a cooperative arrangement between the Division of State & Private Forestry and the Intermountain Forest and Range Experiment Station.

The following agencies are conducting or actively participating in white pine blister rust control:

U. S. Forest Service
National Park Service
State of Idaho
Clearwater Timber Protective Association
Potlatch Timber Protective Association
Priest Lake Timber Protective Association
University of Idaho

Antibiotics

When Acti-dione is applied by the basal stem method to western white pine, all potentially-damaging infection is killed on trees 50 feet in height regardless of location of the infection in the tree. All evidence indicates that the same results can be attained on mature western white pine. Mature trees have been treated by the basal stem method and the results will be known in June 1960.

Investigation of the translocation and the persistence of Acti-dione in western white pine by direct analytical methods of paper chromatography and of bioassay showed that the antibiotic is absorbed by, persists in, and is translocated upward in pole-size western white pine. The antibiotic persists for at least two years in the trunk bark of western white pine treated by the basal stem method.

Acti-dione can be applied any month of the year with highly effective results providing the bark surface is not coated with ice. Preinfection resistance has been successfully established in western white pine nursery-grown seedlings by applying antibiotics to the soil for root absorption and translocation to aerial parts.

Antibiotics were applied as a foliar spray in both water and oil solutions by helicopter in June 1959. Ten plots were treated with Phytoactin, three with semicarbazone, and one with Acti-dione. Very encouraging results were observed on these plots in November 1959. Complete results may be known in June 1960.

To date, no ill side-effects have been associated in any way with the use of antibiotics for blister rust control.

Change in Control Methods

The developments mentioned have greatly revolutionized our present blister rust control methods and control area concept. Our long-term objective now is to treat with antibiotics all potentially commercial advanced reproduction and pole stands of western white pine in this Region if and when treatment is needed. In general, the initial treatment should be accomplished by 1970.

Approximately 60 percent of the present blister rust control area will be brought on through to commercial maturity with antibiotics and without additional ribes eradication.

New pine areas added to the control program will be of such a nature that they can be brought through to commercial maturity without ribes eradication by application of antibiotics. At this time we are concerned only with the present crop on these areas. The second crop will depend much on developments in rust resistant pine and antibiotics plus economic changes.

Until the full potential of antibiotics are known and field-tested, ribes eradication will be continued only on the following class of areas:

a. Controlled burned areas being prepared for planting to western white pine.

b. Areas planned for natural western white pine regeneration.

c. Stands under 20 years of age.

d. Stream type and newly disturbed protection zone.

e. Heavy ribes concentration in or near pole stands in high rust-hazard area.

In 1960 about 60 percent of the field crews will be employed in the application of antibiotics.

Control accomplishments

During 1959 upward of 4,000,000 trees on 17,000 acres were treated with Acti-dione by the basal stem method. Blister rust control crews eradicated ribes on 65,000 acres. Both control methods were used on national forest, national

park, and state and private lands. A sizeable increase in ribes eradication by contracting was accomplished. Seventy-one contracts were awarded for 2,800 acres. Some 6,188 man-days were spent on forest fire suppression by BRC crews as compared to 7,900 man-days in 1958.

Northern Idaho Forest Genetics Center

Routine work in controlled, test-crossing of new rust-resistant parent trees continued at twice the previous rate. Through 1956, the crossing program included 50 rust-resistant parents. Since that time, a new test-crossing program has included another 100 trees. There is now in stock 360 lots of test-cross seed from 1957 and 1958 pollinations. These along with 140 more lots from 1959 pollinations, are destined for a long progeny test to be sown in the fall of 1960.

The 17-acre Sandpoint Experimental Seed Orchard is prepared and staked for graft plantings in the spring of 1960. Fifteen hundred grafts slated for this orchard are undergoing another growth period in the greenhouse at Moscow, Idaho.

With the addition of Dr. Burton V. Barnes, Research Forester, Intermountain Forest and Range Experiment Station, the staff is now at full strength.

National Parks

For the time being, ribes eradication work in Rocky Mountain National Park was completed in 1959. In Glacier National Park western white pines were treated with Acti-dione. Several test plots were established in whitebark and limber pine stands to determine the effectiveness of Acti-dione and Phytoactin treatment of blister rust infection on these species.

Spread of Blister Rust

Blister rust was found on white pine for the first time in the Bighorn and Teton National Forests. These two new locations extend known limits of the rust on white pine in Wyoming. Limber pine, like whitebark pine is proving to be both highly susceptible to white pine blister rust infection and damage. White pine blister rust infection on ribes was very light through the Inland Empire in 1959.

Meetings

The National Blister Rust Control Meeting was held in Spokane, Washington, on April 20-22. Representatives from the Washington Office, regions with blister rust control activities and experiment stations were in attendance. The use of antibiotics in blister rust control and the development and production of rust resistant white pine were the more important items discussed. A one-day field trip was made to view the Northern Idaho Forest Genetics Center at Moscow, Idaho, and Acti-dione work on the St. Joe National Forest.

The annual fall blister rust control seminar was held at Kalispell Bay on the Kaniksu National Forest in October. Over 50 personnel from the Washington Office, Intermountain Forest and Range Experiment Station, Region 5 and

forests of Region 1 were in attendance. The use of antibiotics in the control of blister rust was the main topic. Stands of white pine with varying degrees of infection were inspected and appraised as to the types of surveys needed, methods of treatment, and stand values.

Finances

The overall blister rust control program directed by Region 1 exceeded $2,000,000 in 1959. This is the largest program the region has had since the CCC days. This sizeable program was due to the increased federal appropriation for white pine blister rust for FY 1959 and 1960.

1. Blister Rust Control Expenditures, Calendar Year 1959

State	U. S. Forest Service Region 1 - Funds					National Park Service	State and Private	Total
	720	042	411	K-V	Total			
Idaho	$145,102	$1,084,954	$95,733	$48,787	$1,374,576	-	$84,677	$1,459,253
Mont.	20,147	94,373	-	2,046	116,566	$ 31,720	-	148,286
Wash.	22,799	227,046	-	9,070	258,915	-	-	258,915
Colo.	2,523	-	-	-	2,523	13,164	-	15,687
Wyo.	8,019	-	-	-	8,019	116,105	-	124,124
Total	$198,590	$1,406,373	$95,733	$59,903	$1,760,599	$160,989	$84,677	$2,006,265

720 - Leadership and technical direction for all programs
042 - National forest program
411 - Federal matching funds for State and Private programs
K-V - Stand improvement collections used for BRC on national forest lands

2. Field Organization - 1959

Program	Camps	Employees	Contractors
National forest	31	885	37
National park	7	132	-
State and Private (Idaho)	6	180	1
All programs	44	1,197	38

3. Ownership in Blister Rust Control Areas

Program	National forest acres	National park acres	Public domain acres	State acres	Private acres	Total acres
National forest	816,510	-	3,070	25,780	73,040	918,400
National park	-	53,180	-	-	-	53,180
State and Private (Idaho)	14,430	-	3,830	63,710	96,070	178,040
All programs	830,940	53,180	6,900	89,490	169,110	1,149,620

4. Total Progress of Ribes Eradication - 1959

Program	Working	Acres	Man-days	Ribes	Per acre	
					Man-days	Ribes
National forest	Initial	4,980	6,770	2,135,000	1.36	429
	Rework	35,910	20,540	1,125,000	.57	31
	Maintenance	13,990	3,560	54,000	.25	4
	Total	54,880	30,870	3,314,000	.56	60
National parks	Initial	3,750	3,080	744,000	.82	198
	Rework	5,090	2,660	202,000	.52	40
	Maintenance	2,750	330	6,000	.12	2
	Total	11,590	6,070	952,000	.52	82
State and Private (Idaho)	Initial	1,620	2,630	537,000	1.62	331
	Rework	6,530	3,290	105,000	.50	16
	Maintenance	1,970	630	11,000	.32	6
	Total	10,120	6,550	653,000	.65	65
All programs	Initial	10,350	12,480	3,416,000	1.21	330
	Rework	47,530	26,490	1,432,000	.56	30
	Maintenance	18,710	4,520	71,000	.24	4
	Total	76,590	43,490	4,919,000	.57	64

5. Antibiotic Work - 1959

Program	Acres treated	Man-days	Trees treated	Per acre	
				Man-days	Trees treated
National forest	14,770	8,040	3,552,000	.54	240
National park	860	190	38,000	.22	44
State and Private (Idaho)	1,880	1,090	480,000	.58	255
All programs	17,510	9,320	4,070,000	.53	232

6. Status Checking and Surveys - 1959

Program	Type	Acres	Man-days
National forest	Status check	30,910	750
	Surveys	59,230	680
	Total	90,140	1,430
National park	Status check	3,260	40
	Surveys	5,340	20
	Total	8,600	60
State and Private (Idaho)	Status check	4,440	120
	Surveys	960	30
	Total	5,400	150
All programs	Status check	38,610	910
	Surveys	65,530	730
	Total	104,140	1,640

7. Total Effective BRC Field Man-days - 1959

Program	Ribes eradication	Antibiotic work	Checking and surveys	Pruning	Total
National forest	30,870	8,040	1,430	90	40,430
National park	6,070	190	60	10	6,330
State and Private (Idaho)	6,550	1,090	150	10	7,800
All programs	43,490	9,320	1,640	110	54,560

8. Contracting Ribes Eradication - 1959

Program	Number of contracts	Acres	Man-days	Ribes destroyed	Dollars
National forest	70	2,800	1,416	33,000	$39,995
State and Private (Idaho)	1	20	30	1,000	394
All programs	71	2,820	1,446	34,000	$40,389

9. Chemical Eradication - 1959

Program	Acres	Man-days	Ribes destroyed	Gallons of spray solution	Man-days per acre
National forest	1,760	3,310	2,032,000	420,900	1.88
National park	1,460	2,500	737,000	77,000	1.71
State and Private (Idaho)	410	1,000	467,000	108,700	2.44
All programs	3,630	6,810	3,236,000	606,600	1.88

10. Acres in Control Area by Age Classes

Program	Total acres	Age classes by stand origin				
		1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
National forest	918,400	43,040	189,590	275,790	50,040	359,940
National park	53,180	- - -	- Not classified -	- - - -	- - - -	- - - -
State and Private (Idaho)	178,040	26,190	64,500	45,480	6,250	35,620
All programs	1,149,620	69,230	254,090	321,270	56,290	395,560

11. Summary of Control Status

Program	Total acres	Unworked acres	Area worked	
			Acres needing rework	Acres on maintenance
National forest	918,400	228,500	367,090	322,810
National park	53,180	12,000	9,670	31,510
State and Private (Idaho)	178,040	34,450	73,260	70,330
All programs	1,149,620	274,950	450,020	424,650

Forty-man BRC camp. Potter Creek - Coeur d'Alene National Forest.

Experimental helicopter spraying of clear-cut area with diesel oil to facilitate burning green brush. Potter Creek - Coeur d'Alene National Forest.

II. NATIONAL FOREST PROGRAM

Clearwater National Forest

Nearly all planned ribes eradication work was accomplished despite the loss to blister rust control of 1,080 effective man-days spent on fire fighting activities. This represents 13 percent of the man-days actually spent on blister rust control work. The caliber of men was considerably above average, and a greater number of experienced men returned than in previous years. There was less labor turnover than usual.

Forest Service crews worked on ribes eradication in 10 white pine management units. In the Musselshell area hand eradication was performed in Unit 54, Musselshell, in white pine plantation areas and their protective zones; broadcast spraying of ribes was done for the protection of white pine in Unit 1, Fan Creek; the roadside ribes were removed before they could cast seed in the light-cutting areas in Unit 6, Lolo-Nevada; Unit 10, Gold Creek; and Unit 53, Lower Musselshell. In the general French Creek area hand eradication was performed to destroy heavy ribes concentrations in portions of the plantation and pole stands in Unit 18, Sylvan; in Unit 19, Tamarack; and Unit 59, Orogrande-French. In the Kelly Creek area initial stream type spraying was continued in Unit 47, Deception Creek, and initial roadside work was done in Unit 48, Osier.

Until some further disturbance occurs this completes the ribes eradication work in Units 1, Fan Creek; Unit 10, Gold Creek; Unit 18, Sylvan; and in large portions of Unit 19, Tamarack; and Unit 53, Lower Musselshell.

For the entire season a 25-man crew was engaged in the application of Acti-dione. In Unit A-27, Beaver Creek, the work started in 1958 in this white pine plantation, was completed in 1959. In this unit and in Unit A-23, Alder Creek, the areas treated in 1958 by the slit method were covered again to treat all trees by the basal stem method. All of the white pine plantation in Unit 18, Sylvan, was treated. Abnormally wet weather in September and October curtailed late season Acti-dione work.

In anticipation of an accelerated antibiotic program in the near future, some aerial reconnaissance by helicopter was conducted preliminary to making a plan of needed stocking and rust development surveys.

In the 1960 field season ribes eradication work will be confined principally to areas planned for natural white pine reproduction, stream type, newly disturbed protection zones, and preparing controlled burns for planting to western white pine.

By Marvin C. Riley, Forester in Charge

Coeur d'Alene National Forest

The 1959 control program was the largest for the past 10 years. Peak employment of seasonal workers increased from the past 5-year average of 135 to 200. Effective man-days increased to 9,180 compared to the past 5-year average of 5,470. Work was performed from 5 regular 30-to 35-man camps, one 15-man camp.

One 10-man crew worked out of the Shoshone Work Center. Favorable weather and less than normal drain for fire control resulted in above average number of effective days per worker. Six hundred man-days were expended on fire suppression on the Coeur d'Alene and adjacent national forests.

Contract eradication was resumed on a small scale. Seven contracts were awarded totaling 290 acres. Contractor earnings were not sufficiently high to attract other prospective bidders. Three contracts were advertised in mid-August but no bids were received.

The program for treating infected white pine with antibiotics was increased considerably over 1958. On 1,300 acres 429,000 trees were treated. Most of the work was done in the high value 20-to 35-year-old plantations in the Cathedral and Brett Creek units. Two and three-fourths miles of project road was built in the Brett Creek unit for access to additional plantations for the 1960 antibiotic program.

The 1959 chemical ribes eradication program was the largest in the over 30-year history of blister rust control on the Coeur d'Alene Forest. Nine hundred acres were covered with seven truck-mounted sprayers. Chemical eradication was brought up to date on the 2,000 acres of control burned areas in the Potter Creek unit. This will make possible the proper timing of future eradication and planting.

Five hundred acres of white pine were planted on the Potter Creek, Riley Creek and Flora Miller Hill control burn areas. This was all the area on which ribes eradication had progressed far enough to permit the planting of white pine. Fall weather conditions prevented the burning of additional areas.

The permanent BRC organization was increased during the year by the addition of Kenneth D. Thomsen, junior forester, and transfer of Camp Superintendent Rudolph C. Lood from the Kaniksu National Forest.

Good progress was made on the improvement of the Trail Creek and Hudlow Work Centers. The Trail Creek messhall was remodeled and enlarged to double its former capacity. A new bathhouse and warehouse was constructed. The old Breakwater Work Camp was dismantled and much of the material used in the Trail Creek construction. Propane gas ranges, water heaters and space heaters were installed in the Hudlow and Trail Creek messhalls.

By Harry J. Faulkner, Forester in Charge

Kaniksu National Forest

A high percentage of experienced workers returned in 1959 to carry out another successful field season. All employees were thoroughly trained and given written examinations to test their comprehension of the blister rust control objectives. The program was highlighted by a greatly increased antibiotic program as well as an increase in ribes eradication contracting.

A total of 10 camps were operated throughout the season, employing 260 men. One camp was on the Colville National Forest and the other camps were located in the Priest River drainage.

The antibiotic program for 1959 was initiated in April when a 10-man crew completed treatment of the Cuban Hill plantation. Four more antibiotic crews were organized during the summer with approximately 50 men doing the bulk of the work. One 30-man camp in the Kalispell Creek drainage was entirely employed in antibiotic work. In this unit, pack mules proved effective for transporting the Acti-dione spray solution to crew members in areas not easily accessible by road. Additional areas were treated in Upper Lamb Creek, Fedar Creek, and Kalispell Bay units. On the Colville Forest, a 5-man crew treated 500 acres of white pine in the Tiger Hill plantation.

The basal stem method of antibiotic application was used exclusively during the 1959 season.

During July an experimental area was set up in the Kalispell drainage by Virgil Moss of the D&I Unit in cooperation with The Upjohn Company. BRC crews from the Kalispell Creek Camp treated approximately 7,000 white pine trees on the experimental area with Acti-dione and its derivatives.

The contracting program increased steadily during 1957 and 1958 and was nearly doubled in 1959. An article published by the local newspapers early in June explaining the program brought considerable response and a number of additional contractors began work. Areas contracted this year were more difficult to work than previously, so bid prices were higher. A total of 3,350 acres have been completed or are under contract and will be completed in 1960. To assure a continuing program next year, 14 contract areas were laid out in the late summer of 1959 and will be awarded early in 1960.

One portable and four truck-mounted sprayers were used on the chemical operation in 1959. Total acreage of chemical application continues to decrease each year as more units near the maintenance standard. A large percentage of chemical application was performed on recently cut-over lands. Four 1956 1½-ton stake trucks were obtained on surplus during 1959. These trucks have replaced the older models and will prove to be a great asset to the chemical power-spray operation. Wood flour, used as a marker, proved very effective in spotting poor application of chemical solution. This marker will continue to be used in 1960.

An extensive stocking and disease survey program was conducted during the 1959 season. A crew of six men inspected plantations in Pilgrim, Skelton and South Fork of Martin Creeks in Montana. Many areas were also inspected in Washington and Idaho. One of the purposes of the survey was to determine antibiotic treatment priority of stands inside and outside present control units.

New gas refrigerators and gas ranges marked a continued effort to modernize the field camps. The additional advantage of electric lights were added to one field camp through the purchase of a gasoline-powered generator. Additional units will be put into use next season.

The annual Region 1 BRC field meeting was held at Kalispell Bay during the week of October 11 through 16. About 50 people attended including Conrad Wessela of the Washington Office and Ray Blomstrom of Region 5. U. S. Senator Dworshak of Idaho also spent several days at headquarters inspecting the antibiotic program.

The Kaniksu Forest had no large fires this season, but BRC crews spent 1,100 man-days fighting fire on the Kootenai, Lolo and Clearwater Forests and 21 man-days on the Colville Forest. BRC personnel aided the Kaniksu fire control organization on a control burn of 100 acres near Goose Creek.

Rudolph Lood, Camp Superintendent, transferred to the Coeur d'Alene Forest in November. James Abbott, Jr., forester, joined the BRC organization as a full-time employee replacing Robert Graham who transferred to the Clearwater Forest.

By Harold E. Anderson, Forester in Charge
Quentin W. Larson, Project Officer

Kootenai National Forest

Accomplishments in the 1959 field season exceeded planned work, despite man-day loss to fire suppression and to rainy weather. In the analysis of work done, one of the highlights was acreage worked per man-day. This can be accounted for by better crews as a result of more emphasis on recruiting. A better quality of supervision was obtained because of experienced overhead returning.

Ribes eradication work was done by a 25-man crew in the Spar Lake Unit. This completes the ribes eradication job in the white pine pole stands in this unit. With some antibiotic work, these pole stands will come through to maturity. A truck-mounted power spray unit was used on roadside spraying and on a cutover area at the head of Hiatt Creek.

Antibiotic treatment of infected white pine was started the middle of April with a 5-man crew on the Star Creek plantation. In June this crew was increased to 10 men and worked on antibiotic treatment throughout the entire field season. Upon completion of Star Creek, the crew treated 625 acres in Keeler Creek and a 100-acre plantation in the Spar Lake Unit.

Damage and stocking surveys were accomplished on 27,440 acres by a 6-man survey crew. Purpose of the survey is to obtain a complete inventory of all potential commercial white pine stands and the amount of rust damage as a basis for control work with antibiotics on areas inside and outside present control units. Of the total acreage surveyed, 12,550 acres were on eight areas outside of present program units.

An extensive I&E program was carried on during the year. The spring field trip of the Libby Chapter of Society of American Foresters observed the antibiotic work on the Star Creek plantation. Exhibit material on antibiotic treatment of white pine and on work being done on disease resistant white pine was on display to the public at Libby. The local newspaper carried news items to bring attention to the displays when exhibited.

Loss of effective blister rust control man-days to fire suppression was 15% as compared to 49% in 1958. All blister rust personnel were on one forest project fire for 5 days and one blister rust crew of 20 men was detailed to the Flathead Forest for 5 days.

The operation went through another year without a lost time accident. A total of 200,290 man-hours have been worked since the last lost time accident on July 5, 1951.

By Frank J. Kapel, Forester in Charge

St. Joe National Forest

The forest blister rust control program was administered by Staffman Clyde J. Miller. The checking and disease survey work was under the supervision of Assistant Wayne F. Painter. David Graham was in charge of the field operations. Unit Supervisors were John Chapman and Albert Turner. Dave Graham transferred to the Clarkia District as assistant ranger in charge of timber management on November 15, 1959. John Chapman moved to the Red Ives District on September 21 as forester in timber sales administration. Oliver Goldammer replaced Chapman as BRC unit supervisor.

Ribes were eradicated in parts of the following national forest control units during the 1959 season: North Fork Palouse (159), Big Sand (162), Little Sand (163), Mannering - East Fork Meadow (155), East Fork Charlie (117B), West Fork Potlatch (178), Hog Meadow (164), and Butterfield - Oviatt (192). Regular eradication work was completed in the pole stands of the Palouse River and Sand Creek drainages. Extensive work has been necessary in these white pine stands due to the severe blow-down and snow damage of 1949. No further eradication work is planned in these areas unless additional ground disturbance occurs.

The checker-flanker eradication method was used to cover 11,627 acres of white pine stands having a light ribes population. The checker-flanker procedure continues to be a very economical and practical method of working areas having few, scattered, ribes.

The application of antibiotics to white pine for the control of blister rust was expanded to 42 spraymen during the 1959 field season. Crews treated 1,204,100 trees on 6,980 acres of federal land in the West Fork Charlie (117C), Ramskull - Willow (116A), Clarkia (130), Feather - Porcupine (179), Nat Brown - Purdue (180), Bull Run (190), and Elk River (187A) units. Antibiotic work was concentrated on plantations and other high priority areas, within the present control boundary, where early infection was severe. The antibiotic program will be increased to 140 spraymen in 1960.

The St. Joe ribes eradication program will be reduced and the antibiotic program expanded in 1960. Only 60 workers are planned for ribes eradication work compared to 120 in 1959. Next season's ribes eradication work will be concentrated on recently logged areas and stream zones where ribes populations are moderate to heavy.

A 6-man survey crew completed the sampling of mature white pine stands in the Gold, Tumbledown, and Eagle Creek drainages on the St. Joe River above Avery, Idaho. The survey was conducted to determine the extent and severity of blister rust damage to the 120- to 140-year-old white pine. The survey data is necessary for forest engineers and timber resource managers to realistically establish priorities in road building and timber sales.

Blister rust control crews spent 1,222 man-days suppressing fires on the Avery and Red Ives Districts during the first week of August. The BRC fire fighters were replaced by Indian mop-up crews when control was established.

Preliminary work has been started on the move of the blister rust control headquarters from the old Rutledge Lumber Camp near Clarkia, Idaho, to the Clarkia Ranger Station. It is planned to have all office, kitchen, and living facilities moved to the new location by the fall of 1960.

By Clyde J. Miller, Forester in Charge

1. Expenditures, Calendar Year 1959

Forest	720 Funds	042 Funds	K-V Funds	Total
Clearwater*	$10,501	$ 242,932	$27,615	$ 281,048
Coeur d'Alene	21,330	294,211	11,326	326,867
Kaniksu*	29,838	395,638	18,408	443,884
Kootenai	5,685	70,416	2,046	78,147
St. Joe*	18,014	306,741	508	325,263
Total	$85,368	$1,309,938	$59,903	$1,455,209

*Also had cooperative State and Private Program

2. Field Organization - 1959

Forest	Camps	Employees	Contractors
Clearwater	6	200	-
Coeur d'Alene	7	200	7
Kaniksu	10	260	30
Kootenai	2	45	-
St. Joe	6	180	-
All forests	31	885	37

3. Ownership in National Forest Units

Forest	State	National forest acres	Public domain acres	State acres	Private acres	Total acres
Clearwater	Idaho	166,590	370	3,540	8,350	178,850
Coeur d'Alene	Idaho	257,600	-	4,400	7,100	269,100
	Montana	7,900	-	-	3,600	11,500
	Total	265,500	-	4,400	10,700	280,600
Kaniksu	Idaho	121,620	-	3,770	19,210	144,600
	Montana	24,060	-	640	1,960	26,660
	Washington*	67,180	-	830	3,060	71,070
	Total	212,860	-	5,240	24,230	242,330
Kootenai	Idaho	15,810	-	-	-	15,810
	Montana	73,550	-	-	1,260	74,810
	Total	89,360	-	-	1,260	90,620
St. Joe	Idaho	82,200	2,700	12,600	28,500	126,000
Total	Idaho	643,820	3,070	24,310	63,160	734,360
	Montana	105,510	-	640	6,820	112,970
	Washington	67,180	-	830	3,060	71,070
Grand total		816,510	3,070	25,780	73,040	918,400

*15,220 acres are in the Colville National Forest

4. Total Progress of Ribes Eradication - 1959

Forest	Working	Acres	Man-days	Ribes	Per Acre	
					Man-days	Ribes
Clearwater	Initial	1,200	1,640	954,000	1.37	795
	Rework	3,600	4,510	61,000	1.25	17
	Maintenance	1,430	1,050	8,000	.73	6
	Total	6,230	7,200	1,023,000	1.16	164
Coeur d'Alene	Initial	1,660	2,820	461,000	1.70	278
	Rework	5,260	4,550	119,000	.87	23
	Maintenance	1,750	260	2,000	.15	1
	Total	8,670	7,630	582,000	.88	67
Kaniksu	Initial	390	530	234,000	1.36	600
	Rework	12,660	8,030	692,000	.63	55
	Maintenance	4,880	1,030	11,000	.21	2
	Total	17,930	9,590	937,000	.53	52
Kootenai	Initial	220	10	-	.05	-
	Rework	1,060	210	35,000	.20	33
	Maintenance	1,150	820	31,000	.71	27
	Total	2,430	1,040	66,000	.43	27
St. Joe	Initial	1,510	1,770	486,000	1.17	322
	Rework	13,330	3,240	218,000	.24	16
	Maintenance	4,780	400	2,000	.08	1
	Total	19,620	5,410	706,000	.28	36
All forests	Initial	4,980	6,770	2,135,000	1.36	429
	Rework	35,910	20,540	1,125,000	.57	31
	Maintenance	13,990	3,560	54,000	.25	4
	Total	54,880	30,870	3,314,000	.56	60

5. Antibiotic Work - 1959

Forest	Acres treated	Man-days	Trees treated	Per acre	
				Man-days	Trees treated
Clearwater	1,390	1,090	457,000	.78	329
Coeur d'Alene	1,300	1,250	429,000	.96	330
Kaniksu	3,810	2,330	953,000	.61	250
Kootenai	1,290	670	509,000	.52	395
St. Joe	6,980	2,700	1,204,000	.39	172
All forests	14,770	8,040	3,552,000	.54	240

6. Status Checking and Surveys - 1959

Forest	Type of work	Acres	Man-days
Coeur d'Alene	Status check	7,250	210
	Surveys	3,000	60
	Total	10,250	270
Kaniksu	Status check	9,370	240
	Surveys	16,790	210
	Total	26,160	450
Kootenai	Status check	4,690	110
	Surveys	27,440	200
	Total	32,130	310
St. Joe	Status check	9,600	190
	Surveys	12,000	210
	Total	21,600	400
All forests	Status check	30,910	750
	Surveys	59,230	680
	Total	90,140	1,430

7. Total Effective BRC Field Man-days - 1959

Forest	Ribes eradication	Antibiotic treatment	Checking and surveys	Pruning	Total
Clearwater	7,200	1,090	-	-	8,290
Coeur d'Alene	7,630	1,250	270	-	9,150
Kaniksu	9,590	2,330	450	-	12,370
Kootenai	1,040	670	310	-	2,020
St. Joe	5,410	2,700	400	90	8,600
All forests	30,870	8,040	1,430	90	40,430

8. K-V Work - 1959

Forest	Acres worked	Man-days
Clearwater	550	650
Coeur d'Alene	420	600
Kaniksu	1,230	920
Kootenai	40	50
St. Joe	70	20
All forests	2,310	2,240

9. Chemical Eradication - 1959

Forest	Acres	Man-days	Ribes destroyed	Gallons of spray solution	Man-days per acre
Clearwater	180	330	872,000	53,000	1.83
Coeur d'Alene	900	1,930	430,000	206,300	2.14
Kaniksu	500	920	675,000	135,000	1.84
Kootenai	180	130	55,000	26,600	.72
All forests	1,760	3,310	2,032,000	420,900	1.88

10. Contracting Ribes Eradication - 1959

Forest	Number of contractors	Acres	Man-days	Ribes destroyed	Dollars
Coeur d'Alene	7	290	240	9,000	$ 4,671
Kaniksu	63	2,510	1,176	24,000	35,324
All forests	70	2,800	1,416	33,000	$39,995

11. Acres in Control Area by Age Classes

Forest	Total acres	Age classes by stand origin				
		1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
Clearwater	178,850	14,190	15,790	38,350	11,460	99,060
Coeur d'Alene	280,600	9,100	61,000	41,100	17,300	152,100
Kaniksu	242,330	14,230	62,160	91,980	10,230	63,730
Kootenai	90,620	420	3,040	39,860	5,550	41,750
St. Joe	126,000	5,100	47,600	64,500	5,500	3,300
All forests	918,400	43,040	189,590	275,790	50,040	359,940

12. Summary of Control Status

Forest	Total acres	Unworked acres	Area worked	
			Needing rework	On maintenance acres
Clearwater	178,850	83,770	59,770	35,310
Coeur d'Alene	280,600	84,200	145,810	50,590
Kaniksu	242,330	16,790	79,020	146,520
Kootenai	90,620	40,840	14,690	35,090
St. Joe	126,000	2,900	67,800	55,300
All forests	918,400	228,500	367,090	322,810

Crewman treating ribes with 2,4,5-T chemical from truck-mounted sprayer. Complete coverage of the leaves and crowns is required. Note scarifier on nozzle tip to improve crown soakage. Kaniksu National Forest.

An eradication crewman removing a ribes lacustre by hand method. For protection from injury, each man is required to wear gloves, a hard hat and caulk boots. Kaniksu National Forest.

III. STATE AND PRIVATE PROGRAM (IDAHO)

Clearwater Timber Protective Association (Clearwater National Forest)

Crews from two State and Private camps worked on lands within the Association. Satisfactory progress was made in meeting the season's planned accomplishments even though 19 percent of the available effective man-days were spent on fire fighting activities. The quality of labor was above average and there was less turnover than in previous years.

Crews from the Snake Creek camp completed the initial spraying in stream type and worked in natural reproduction and protection zone areas in Unit 16. Crews from Hildebrand completed the necessary rework in natural reproduction stands in Hildebrand Creek, Mutton Gulch and along Orofino Creek to the national forest boundary in Unit 6 and worked in the excellent young white pine stand in Unit 3, Browns Creek. On all areas covered no further work is anticipated until some future disturbance occurs.

The use of antibiotics to kill blister rust in diseased trees on Clearwater Timber Protective Association lands was initiated in 1959. Acti-dione was applied to white pine stands of the old ski hill area near Headquarters in Unit 17, Reeds Creek, and in selected portions of natural reproduction in Unit 6, Hildebrand. Acti-dione treatment of the white pine plantation in Flat Creek on State of Idaho land in this same unit was nearly completed. Abnormal heavy rains in September and October prevented completing the work on this plantation.

Within present program units on the Clearwater Timber Protective Association there is a large acreage of natural white pine reproduction which has occurred following logging. On much of this area an appreciable increase in ultimate white pine volume can be realized by treating infected trees with antibiotics. Surveys to be conducted during the coming field season will determine the amount of white pine acreage which can be added to the present program through the application of antibiotics. A material increase in antibiotic treatment of trees on Clearwater Timber Protective Association lands is planned for 1960.

During the summer of 1959 a field discussion and demonstration of the use of antibiotics was conducted. Representatives of the State of Idaho, Forest Service and private industry attended. During the 1959 field trip of the Idaho State Land Board and the Idaho Cooperative Board of Forestry, the blister rust control program with special emphasis on the use of antibiotics was demonstrated and discussed.

By Marvin C. Riley, Forester in Charge

Potlatch Timber Protective Association (St. Joe National Forest)

St. Joe Forest insect and disease control personnel directed the blister rust control work on the State and Private units. The 1959 work program consisted of two 30-man eradication camps, two chemical power sprayers, and one 8-man antibiotic treating crew.

One of the ribes eradication camps was located at Badger Meadows on the East Fork Potlatch Creek. Hand eradication crews from this camp removed ribes from the recently cutover lands in the Badger Meadows unit (185A). In addition, the two truck-mounted power sprayers were used to spray numerous ribes with 2,4,5-T chemical on 210 acres in the same unit. One more camp-season should complete the initial eradication work in this unit. The second camp was located on the East Fork Potlatch drainage near the mouth of Bobs Creek. This camp eradicated ribes from the Fry (181A) and Bobs Creek (181B) units.

The 8-man antibiotic crew treated 39,700 young white pine with Acti-dione on the Elk River (187A) and Bull Run (190) units. Additional application of Acti-dione is planned for next season with a 30-man crew on the State and Private units near Elk River.

Blister rust control crews from the Squaw Creek camp were dispatched to the CTPA on fire suppression details for 215 man-days during the first week of August.

By Clyde J. Miller, Forester in Charge

Priest Lake Timber Protective Association (Kaniksu National Forest)

Both antibiotic and ribes eradication work was performed on State and Private units in 1959. Two camps were in operation, one primarily for ribes eradication and the other for treatment of western white pine trees with Acti-dione.

Fox Creek camp, located near the Priest River Experimental Forest in the Fox Creek unit, treated 800 acres of very fine white pine pole timber with Acti-dione. This stand was badly infected with blister rust and work was necessary to protect the present stocking from additional losses.

Mosquito Bay camp performed both work with antibiotic and hand ribes eradication in the Caribou and Bear Creek units. The Acti-dione treatment essentially involved stands along the creeks covering 280 acres in both units.

Ribes eradication work was accomplished in the Caribou Creek unit at the remarkably good rate of 0.19 man-days per acre. The entire unit, except two small blocks, is now on maintenance.

A Bean-Cutler pump was used to supply the crews with Acti-dione spray solution in these camps. Several combinations of pumping uphill and siphoning downhill were used with success.

The crews received fire training in cooperation with Priest Lake Timber Protective Association, but since there were no large fires on association lands, the crews received no fire fighting experience during the 1959 season.

Additional antibiotic work is scheduled for Bear Creek in 1960. Some 40 acres of pole stands will be treated with antibiotics through contracting. A 15-man antibiotic and hand eradication crew will work in the Big Creek Drainage.

By Harold E. Anderson, Forester in Charge
Quentin Larson, Project Officer

1. Expenditures, Calendar Year 1959

Timber protective association	Federal funds			State and private funds			Total all funds
	720	411	Total	State	Private	Total	
Clearwater	$5,653	$43,856	$49,509	$29,223	$10,786	$40,009	$89,518
Potlatch (St. Joe)	7,278	35,662	42,940	17,692	8,606	26,298	69,238
Priest Lake (Kaniksu)	2,000	16,215	18,215	8,078	6,292	14,370	32,585
Total	$14,931	$95,733	$110,664	$54,993	$25,684	$80,677	$191,341

720 - Leadership funds
411 - Cooperative control funds

2. Field Organization - 1959

Area	Camps	Employees	Contractors
Clearwater T.P.A.	2	90	1
Potlatch T.P.A. (St. Joe)	2	60	-
Priest Lake T.P.A. (Kaniksu)	2	30	-
All areas	6	180	1

3. Ownership in State and Private Units

Area	State acres	Private acres	Public domain acres	National forest acres	Total acres
Clearwater T.P.A.	15,440	51,140	1,330	2,050	69,960
Potlatch T.P.A. (St. Joe)	17,500	37,900	2,500	5,300	63,200
Priest Lake T.P.A. (Kaniksu)	30,770	7,030	-	7,080	44,880
All areas	63,710	96,070	3,830	14,430	178,040

4. Total Progress on Ribes Eradication - 1959

Area	Working	Acres	Man-days	Ribes	Per acre	
					Man-days	Ribes
Clearwater T.P.A.	Initial	920	1,410	99,000	1.53	108
	Rework	1,070	1,660	44,000	1.55	41
	Maintenance	240	180	5,000	.75	21
	Total	2,230	3,250	148,000	1.46	66
Potlatch T.P.A. (St. Joe)	Initial	700	1,220	438,000	1.74	626
	Rework	2,100	1,310	42,000	.62	20
	Maintenance	1,110	10	1,000	.01	1
	Total	3,910	2,540	481,000	.65	123
Priest Lake T.P.A. (Kaniksu)	Initial	-	-	-	-	-
	Rework	3,360	320	19,000	.10	6
	Maintenance	620	440	5,000	.71	8
	Total	3,980	760	24,000	.19	6
All areas	Initial	1,620	2,630	537,000	1.62	331
	Rework	6,530	3,290	105,000	.50	16
	Maintenance	1,970	630	11,000	.32	6
	Total	10,120	6,550	653,000	.65	65

5. Antibiotic Work - 1959

Area	Acres treated	Man-days	Trees treated	Per acre	
				Man-days	Trees treated
Clearwater T.P.A.	340	250	111,000	.74	326
Potlatch T.P.A. (St. Joe)	460	170	39,000	.37	85
Priest Lake T.P.A. (Kaniksu)	1,080	670	330,000	.62	306
All areas	1,880	1,090	480,000	.58	255

6. Status Checking and Surveys - 1959

Area	Type	Acres	Man-days
Clearwater T.P.A.	Status check	1,500	60
	Surveys	320	20
	Total	1,820	80
Potlatch T.P.A. (St. Joe)	Status check	2,490	50
Priest Lake T.P.A. (Kaniksu)	Status check	450	10
	Surveys	640	10
	Total	1,090	20
All areas	Status check	4,440	120
	Surveys	960	30
	Total	5,400	150

7. Total Effective BRC Man-days - 1959

Area	Ribes eradication	Antibiotic treatment	Checking and survey	Pruning	Total
Clearwater T.P.A.	3,250	250	80	-	3,580
Potlatch T.P.A. (St. Joe)	2,540	170	50	10	2,770
Priest Lake T.P.A. (Kaniksu)	760	670	20	-	1,450
All areas	6,550	1,090	150	10	7,800

8. Chemical Eradication - 1959

Area	Acres	Man-days	Ribes destroyed	Gallons of spray solution	Man-days per acre
Clearwater T.P.A.	200	340	81,000	31,000	1.70
Potlatch T.P.A. (St. Joe)	210	660	386,000	77,700	3.14
All areas	410	1,000	467,000	108,700	2.44

9. Contracting Ribes Eradication - 1959

Timber protective association	Number of contracts	Acres	Man-days	Ribes destroyed	Dollars
Clearwater	1	20	30	1,000	$394.00

10. Acres in Control Area by Age Classes

Area	Total acres	Age classes by stand origin				
		1941-1960	1921-1940	1881-1920	1841-1880	Before 1841
Clearwater T.P.A.	69,960	11,830	34,770	5,200	2,840	15,320
Potlatch T.P.A. (St. Joe)	63,200	13,300	16,900	20,900	2,300	9,800
Priest Lake T.P.A. (Kaniksu)	44,880	1,060	12,830	19,380	1,110	10,500
All areas	178,040	26,190	64,500	45,480	6,250	35,620

11. Summary of Control Status

Area	Total acres	Unworked acres	Area worked	
			Needing rework acres	On maintenance acres
Clearwater T.P.A.	69,960	20,260	27,670	22,030
Potlatch T.P.A. (St. Joe)	63,200	9,900	30,700	22,600
Priest Lake T.P.A. (Kaniksu)	44,880	4,290	14,890	25,700
All areas	178,040	34,450	73,260	70,330

Typical BRC field camp. Tents, 14' by 16', accommodate four men and have wooden floors, heating stove and electric lights. Water barrels placed near each tent for use in case of fire. Kalispell Creek - Kaniksu National Forest.

Portable messhall in typical BRC camp. Equipment includes electricity, gas range, and refrigerator. Kalispell Creek - Kaniksu National Forest.

IV. NATIONAL PARK PROGRAM

The National Park Service, Region II, White Pine Blister Rust Control Program was continued under the same cooperative agreement as in the past. The U. S. Forest Service provided leadership, coordination, technical direction and certain operational services requested by the Park Service.

Personnel participating

Glacier	C. Donald Barnum, Supervisory Park Ranger, in charge
Yellowstone	H. O Edwards, District Ranger, in charge (transferred July 30, 1959) W. S. Chapman, District Ranger, in charge John N. Reeves, Forestry Aid, Unit Supervisor
Rocky Mountain	Harry R. During, Chief Ranger Robert Weldon, Park Forester, in charge
NPS Region II	Maynard Barrows, Forester
U. S. Forest Service Region 1	John C. Gynn, Forester, in charge C. M. Chapman, Forester

Region II White Pine Blister Rust Control Program reappraised, revised and extended through fiscal year 1965.

At the request of Howard W. Baker, Director, National Park Service, Region II, Henry J. Viche and John C. Gynn, U. S. Forest Service, Region 1, met with his Chief of Protection and Ranger Activities Frank W. Childs, Regional Forester Ernest K. Field, Forester Maynard Barrows and other members of his staff in Omaha, Nebraska, February 1959. Because of the rapid progress of blister rust work, increasing wage rates and new developments in controlling the disease, the program was reappraised and revised. A new schedule of the estimated annual man-day and money requirements to perform initial ribes eradication, maintenance control and some necessary rework was made for fiscal years 1960 through 1965. The revised schedule included the introduction of Acti-dione (an antibiotic) for treating diseased western white pine at Glacier National Park. The group discussed deferring initial ribes eradication on the Hidden Valley-Windy Gulch area at Rocky Mountain National Park and those monies to be used for a larger antibiotic program at Glacier National Park in calendar year 1960. After inspecting the Rocky Mountain National Park blister rust control units in July 1959, Homer J. Hartman, Chief of Forest Pest Control, U. S. Forest Service, Region 1, was of the opinion that the funds should be used at Glacier National Park where a more urgent blister rust problem exists. All currently scheduled blister rust control work in Longs Peak-Estes Cone and Boulder Brook units has been completed and there is no known blister rust infection in this park. Park Superintendent James V. Lloyd concurred and agreed to defer starting initial ribes eradication in the Hidden Valley-Windy Gulch area. Recommendations were made accordingly and approved by the Director of the National Park Service in September 1959. Thus, all blister rust control work in 1960 will be in the Glacier and Yellowstone National Parks.

Accomplishments

All ribes eradication work scheduled for 1959 was completed except for one small unworked area at Glacier National Park. Fourteen hundred and sixty acres of the most remote and heaviest ribes concentrations in the Canyon Area of the Yellowstone National Park were power sprayed with 2,4,5-T chemical. All rework and maintenance of control activities that will be required for several years were completed in the Longs Peak-Estes Cone and Boulder Brook units at Rocky Mountain National Park. The use of Acti-dione for controlling blister rust was begun at Glacier National Park. A total of 28,000 reproduction and 10,000 mature western white pine trees were treated on 860 acres bordering roads, trails and high-use areas, as follows: 500 acres at Lake McDonald, 140 acres at Park Headquarters and 220 roadside acres between the two control units. To avoid the excessive cost of searching for diseased trees, all white pine in the designated areas were treated.

Checking and Surveys

A western white pine reconnaissance on approximately 5,200 acres previously considered for control in Glacier National Park was made to ascertain survey needs. Intensive surveys on five of the six areas inspected are planned for 1960. From these data Park officials will determine the areas desirable for inclusion in their antibiotic treatment program. Additional inspections and surveys are being considered. In Yellowstone National Park, pine, ribes and disease surveys were made on 790 acres. No infection was found in the control units. An intensive status check on 2,600 acres showed ribes regeneration has stopped on nearly all portions of the Longs Peak-Estes Cone and Boulder Brook units in the Rocky Mountain National Park.

Control Status

There are now 31,510 acres meeting maintenance control standards. Included are 2,790 acres worked to this standard in 1959.

Antibiotic tests on white bark and limber pine

There are a total of 52,960 acres in the 16 National Park Service, Region II blister rust control units. Of this amount, 50,190 acres comprising 14 units are for the protection of white bark and limber pine. An antibiotic that would kill blister rust cankers on these two pine species as effectively as Acti-dione has proven on western white pine would be of great value in controlling the rust at lower costs in the national parks. The few blister rust infected white bark and limber pines treated with Acti-dione in Glacier National Park and the adjoining Blackfeet Indian Reservation in 1958 showed encouraging results in 1959. Virgil D. Moss, Research Forester, U. S. Forest Service, Region 1, designed a series of test plots to continue testing the effectiveness of antibiotics on these two pine species. A total of 260 trees on 22 plots were treated at Two Medicine Lake and on the Blackfeet Indian Reservation for testing the two antibiotics, Acti-dione (cycloheximide) and Phytoactin. The Acti-dione plots were established in series at 2-week intervals throughout the summer. The basal stem method of applying Acti-dione in No. 1 stove oil was used. Phytoactin was applied in an aqueous solution as a foliar spray. Results will be evaluated after 1960 inspections and future work planned accordingly.

Recommendations for National Park Service Program in calendar year 1960

The following field program reflects the reallocation of funds from Rocky Mountain National Park for expanding the western white pine Acti-dione project at Glacier National Park approved by the Director of the National Park Service. Recommendations are based on a 6-day work week for a complete 3-month working season.

Park & area	GS-6 Camp superintendent	GS-5 checker	Foreman	Working leadmen	Laborers	Total
Glacier						
West Glacier*	1	2		2	7	12
Two Medicine & Oldman Lake	1	1		2	9	13
Total	2	3		4	16	25
Yellowstone						
Antelope Creek		1	1	2	10	14
Maintenance		1	1	2	11	15
Canyon	2	1		11	38	52
Fishing Bridge		1	1		7	9
Total	2	4	3	15	66	90
All totals	4	7	3	19	82	115

* West Glacier includes Acti-dione project and surveys.

By John C. Gynn, Forester in Charge

1. Expenditures, Calendar Year 1959

National park	National park BRC	Forest Service leadership and technical direction	Totals
Glacier	$ 31,720	$ 3,082	$ 34,802
Grand Teton	502	220	722
Rocky Mountain	13,164	1,651	14,815
Yellowstone	115,603	6,054	121,657
All parks	$160,989	$11,007	$171,996

2. Total Progress on Ribes Eradication - 1959

National park	Working	Acres	Man-days	Ribes	Per acre	
					Man-days	Ribes
Glacier	Initial	150	170	18,000	1.13	120
	Rework	640	580	36,000	.91	56
	Maintenance	300	30	1,000	.10	3
	Total	1,090	780	55,000	.72	50
Rocky Mountain	Initial	-	-	-	-	-
	Rework	810	470	15,000	.58	19
	Maintenance	1,760	140	3,000	.08	2
	Total	2,570	610	18,000	.24	7
Yellowstone	Initial	3,600	2,910	726,000	.81	202
	Rework	3,640	1,610	151,000	.44	41
	Maintenance	690	160	2,000	.23	3
	Total	7,930	4,680	879,000	.59	111
All parks	Initial	3,750	3,080	744,000	.82	198
	Rework	5,090	2,660	202,000	.52	40
	Maintenance	2,750	330	6,000	.12	2
	Total	11,590	6,070	952,000	.52	82

3. Field Organization - 1959

National park	Camps	Employees
Glacier	2	21
Rocky Mountain	1	14
Yellowstone	4	97
All parks	7	132

4. Antibiotic Work - 1959

National park	Acres treated	Man-days	Trees treated	Per acre	
				Man-days	Trees treated
Glacier	860	190	38,000	.22	44

5. Status Checking and Survey - 1959

National park	Type	Acres	Man-days
Glacier	Surveys	5,190	10
	Total	5,190	10
Rocky Mountain	Status check	2,620	30
	Total	2,620	30
Yellowstone	Status check	640	10
	Surveys	150	10
	Total	790	20
All parks	Status check	3,260	40
	Surveys	5,340	20
	Total	8,600	60

6. Total Effective BRC Field Man-days - 1959

National park	eradication	Antibiotic treatment	Checking and surveys	Pruning	Total
Glacier	780	190	10	10	990
Rocky Mountain	610	-	30	-	640
Yellowstone	4,680	-	20	-	4,700
All parks	6,070	190	60	10	6,330

7. Chemical Eradication - 1959

National park	Acres	Man-days	Ribes destroyed	Gallons of solution	Man-days per acre
Yellowstone	1,460	2,5000	737,000	77,000	1.71

8. Summary of Control Status

National park	Total acres	Unworked acres	Worked area	
			Needing rework acres	On maintenance acres
Glacier	6,230	390	1,840	4,000
Grand Teton	1,010	-	100	910
Rocky Mountain	12,650	4,050	600	8,000
Yellowstone	33,290	7,560	7,130	18,600
All parks	53,180	12,000	9,670	31,510

V. SCOUTING FOR WHITE PINE BLISTER RUST - 1959

To determine the spread of rust, biennial sample inspections are made on as many drainages as possible outside of known limits of the disease. Where conditions are most favorable for inception and development of the rust inspections are usually made annually. Other examinations are made to determine the buildup of the disease in known border infection centers. Because it has already spread throughout the western white pine type, most scouting is confined to limber and whitebark pine areas. Two bristlecone pine plantations in Colorado are occasionally inspected.

Due to the dense needle growth and long period of needle retention on whitebark, limber and bristlecone, very close examinations are required to find the infection before fruiting cankers occur even in the younger trees easily inspected from the ground. For these reasons, and because of incipient dwarfmistletoe infections and other limb swellings commonly occuring in mature limber pine, most sampling is done on smaller trees where climbing is not required to make positive identification. All ribes species encountered are examined.

Scouting - 1959

Extensive scouting was performed in the States of Montana, Wyoming, northern Colorado, northeastern Utah and southeastern Idaho. A total of 14,310 white pine and 8,360 ribes were examined on 71 drainages which included 19 national forests and 3 national parks.

The disease was found on white pine for the first time in the Bighorn and Teton National Forests. These two new locations extend known limits of the rust on white pine 150 miles east and 20 miles south in Wyoming.

New infection on ribes was found in Sunlight Basin on Russell Creek of the Shoshone National Forest in Wyoming.

Intensification of the disease

Intensive inspections to determine the buildup of the rust were made in Montana and Wyoming.

In the vicinity of the Ben Bow Mine, Stillwater District, Custer National Forest in Montana, 120 limber pines were examined of which 70 were heavily infected with blister rust in the advanced stages. The damage occurring is readily noted by the large amount of "flagging" easily seen in all age classes.

A total of 70 trees were examined at Rock Creek 2 miles west of Red Lodge, Montana. Twenty trees were found to be infected with the rust. It was first discovered here on limber pine in 1952 when only one pycinal stage canker was found. Now, heavily infected trees can readily be seen along several miles of the highway leading to Cooke City and Yellowstone National Park.

Conclusion

White pine blister rust is continually advancing east and southward in the limber and whitebark pine stands. It is spreading and intensifying at an alarming rate in several border areas. Limber pine, like whitebark pine, is proving to be highly susceptible to white pine blister rust infection and damage, even on rather dry sites. The disease has not been found in Colorado or Utah as of December 1959.

White pine blister rust tree infections found in 1959

1. Madison County, Montana - five miles south of Beaverhead National Forest on Eight Mile Creek near Virginia City. T. 6 S., R. 2 W., Sec. 21, Pinus flexilis, origin 1947.

2. Stillwater County, Montana - old chrome mine on Ben Bow claim, Little Rocky Creek, Custer National Forest. T. 5 S., R. 16 E., Sec. 16, P. flexilis, origin 1948.

3. Stillwater County, Montana - Pine Grove campground on West Rosebud Creek, Custer National Forest, T. 6 S., R. 17 E., Sec. 28, P. flexilis, origin 1948.

4. Bighorn County, Wyoming - two miles ease of Falls on Shell Creek, Bighorn National Forest, T. 53 N., R. 89 W., Sec. 15, P. flexilis, origin 1947.

5. Teton County, Wyoming - Teton Pass, on Trail Creek, Teton National Forest, T. 41 N., R. 118 W., Sec. 24, P. flexilis, origin 1947.

White pine blister rust infected ribes found in 1959

1. Madison County, Montana - five miles south of Beaverhead National Forest on Eight Mile Creek near Virginia City, T. 6 S., R. 2 W., Sec. 21, Ribes setosum.

2. Stillwater County, Montana - Little Rocky Creek, Custer National Forest, T. 5 S., R. 16 E., Sec. 16, R. setosum.

3. Stillwater County, Montana - West Rosebud Creek, Custer National Forest, T. 6 S., R. 17 E., Sec. 28, R. setosum.

4. Park County, Wyoming - on Russell Creek, Shoshone National Forest, T. 56 N, R. 150 W., Sec. 25, R. petiolare.

Scouting Summary - 1959

Location	Number drainages scouted	Number pines examined	Number ribes examined	New pine infection	Locations ribes
Montana					
Custer N. F.	6	520	170	2	2
Helena N. F.	1	50	**		
Gallatin N. F.	1	210	**		
Beaverhead N. F.	1	20	20	1	1
Wyoming					
Yellowstone N. P.	9	4,470	3,530		
Shoshone N. F.	11	2,410	690		1
Teton N. F.	4	620	100	1	
Grand Teton N. P.	2	100	20		
Bighorn N. F.	3	1,700	420	1	
Medicine Bow N. F.	4	930	550		
Bridger N. F.*	3	150	310		
Targhee N. F.	3	200	50		
Colorado					
Roosevelt N. F.*	3	50	130		
Pike N. F.	5	950	450		
San Isabel N. F.	1	50	50		
White River N. F.*	3		150		
Rocky Mt. N. P.	5	1,800	1,300		
Utah					
Ashley N. F.	2		100		
Uinta N. F. *	1		50		
Wasatch N. F.	1		50		
Cache N. F.*	1		50		
Idaho					
Caribou N. F.*	1	80	170		
Total all states	71	14,310	8,360	5	4

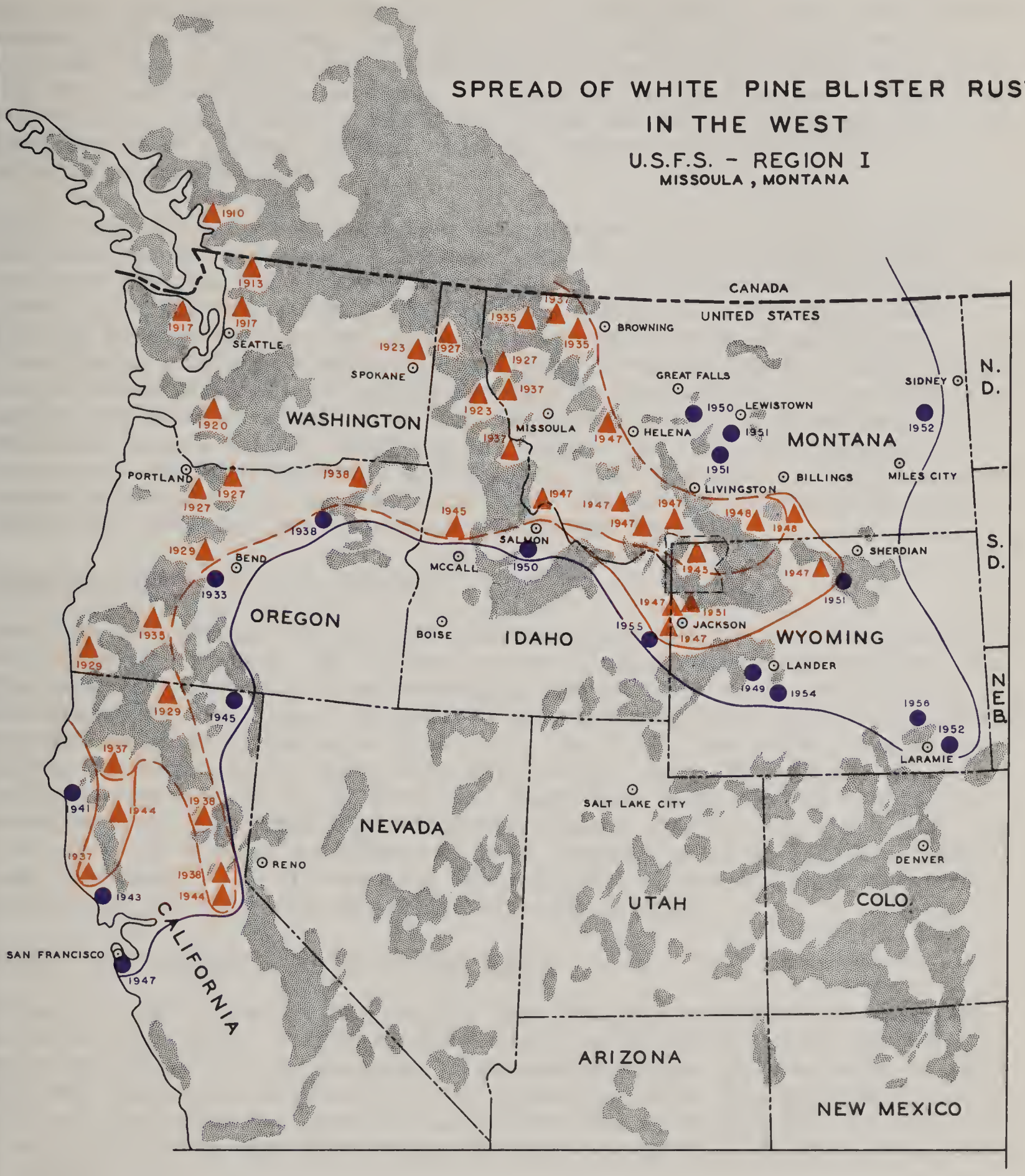
*Pinon rust found. Indicates conditions are favorable for white pine blister rust.

**Rust on ribes found previously.

SPREAD OF WHITE PINE BLISTER RUST IN THE WEST

U.S.F.S. - REGION I

MISSOULA, MONTANA



LEGEND

RED (INFECTION ON WHITE PINE)	PURPLE (INFECTION ON RIBES)
▲ (1910) LOCATION AND YEAR OF INFECTION	● (1956) LOCATION AND YEAR FOUND
– – – BOUNDARY OF INFECTION FOUND PRIOR TO JAN 1,'53	——— BOUNDARY OF INFECTION FOUND TO JAN 1,'60
——— BOUNDARY OF INFECTION FOUND AFTER JAN 1,'53	WHITE PINE
——— STATE LINES	

JANUARY 1960

Agriculture-Missoula

VI. MICROCLIMATE PHASES OF BLISTER RUST CONTROL

Meteorological Problem

The white pine infection stage of the rust is dependent in part upon favorable meteorological conditions. Other things being equal, duration of weather favorable for production and dissemination of sporidia and infection of pine will determine infection patterns. The weather varies from day to day, from year to year, and between localities. Within the range of western white pine, there should be seasons, as well as areas, more or less favorable or unfavorable for the rust.

Differences in rust conditions have been observed which extend through even the "wave years." If these differences can be explained by microclimate, best areas for planting white pine and controlling rust can be selected based on microclimate thereon encountered. Variable standards of ribes tolerance, width of protective zone, and antibiotic treatment could be established, since microclimate existing in each area determines these standards. Thus, the purpose in the applied climatological approach to the blister rust problem is to analyze the meteorological conditions associated with rust's intensification and spread with a view of modifying the blister rust control operation to advantage. The meteorological question is, "How often do favorable and unfavorable conditions for the rust occur under the variety of topographic and vegetative conditions encountered in the Inland Empire?"

Climatic Requirements for the Rust

Favorable temperature and moisture conditions are required for development of each stage of the rust. We are particularly interested in those stages when high temperature or lack of moisture may interrupt the cycle and limit its development for that year. We want to know how often such conditions might be expected to occur in the white pine belt. Dr. E. P. Van Arsdel[1] has found that in Wisconsin, high temperature will inhibit rust (10 days of 95F or higher). However, Dr. R. V. Bega[2] has found that under the dry conditions encountered in California high temperature alone does not limit the rust. He does report that under conditions of high humidity telia will be sterilized by high temperature. He is presently testing combinations of temperature and humidity to see what extremes teliospores can tolerate.

Variation of Climate Over the Inland Empire

We have a fund of weather information from long period stations in and near the white pine belt. When climatic elements which may limit the rust are fully defined it will be possible to determine chances of occurrence of favorable and unfavorable weather for rust intensification. This will tell us how uniformly favorable the general climate over the white pine belt is for rust. It will give us an objective measure of just how often conditions favor rust or inhibit it.

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1. Van Arsdel, E. P, Riker, A. J., and Patton, R. F. 1956. The effects of temperature and moisture on the spread of white pine blister rust. Phytopathology. 46(11): 307-318.

2. Bega, Robert V. 1959. Proceedings of National Blister Rust Control Meeting, Spokane, Washington, April 20-22, pp. 36-39.

Variation of Microclimate in Mountains

We need to extend chances for rust at the long period stations to nearby white pine working units. Relationships between climatic elements and topography and vegetative cover are being established. We hope that when this is done, relative chances for rust based on microclimate can be determined for each working unit or part of a unit from a knowledge of its topography and vegetation.

Distance of Spread

Blister rust spores are formed under conditions of high moisture and germinate immediately. Laboratory studies by Bega[3] show that a telial column starts casting spores about $8\frac{1}{2}$ hours after subjection to 100 percent humidity. The rate of spore casting rises to a given high level and continues for several hours.

Sporidia of blister rust are 8 to 12 microns in diameter. Their fall rates are negligible compared to horizontal air movement encountered in mountainous terrain during periods favorable for their production. Their dispersion reduces to wind transport and eddy diffusion.

Problem of Small-scale Dispersion

The problem of distribution of spores is therefore one of small-scale dispersion from continuous point sources during moist periods. A great many studies have been made of this type of distribution in the fields of chemical warfare, atomic energy, and air pollution. Theoretical equations show maximum concentration of spores at given distances downwind from a source to diminish almost as the square of the distance. Emperical equations have also been developed in which direct meteorological indicators (standard deviations of the azimuth and elevation angles of the wind direction) are substituted for the generalized diffusion coefficients obtained from vertical profiles of mean wind speed in the theoretical equations. Satisfactory estimates of distribution of spores from a ribes bush can be made from these equations if spore production, mean wind speed, frequency distribution of azimuth of wind, and thermal stratification are known.

Air Movement in Mountainous Terrain

To apply this information to the blister rust problem we need to know wind speed and direction and its fluctuations as well as thermal stratification during moist periods of sufficient duration for spore production and pine infection under the variety of topographic conditions encountered in the white pine belt. Many studies have been made under fair weather conditions of wind behavior on elevated terrain, of slope and valley winds and of vertical variation of wind through various cover types. However, little is known of the deformation and intensification of wind by topography and vegetative cover

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3. Bega, Robert V. 1959. The capacity and period of maximum production of sporidia in Cronartium ribicola. Phytopathology. 49(1): 54-57.

during moist periods. Studies have been started to determine air flow during favorable moist periods under the variety of conditions encountered in the Inland Empire and in areas where long distance spread is suspected. We hope that results will make possible a closer definition of protective zones and may explain suspected long distance spread in some areas.

Summary

Management has asked, "What is the difference in microclimate between areas with low ribes population and heavy infection and areas with high ribes population and light infection?" Answers to this question will make it possible to designate and delineate areas to be avoided where conditions for the rust may be so favorable that even a few remaining ribes could cause an intolerable rust buildup. At the other extreme, as new areas are brought into the program control costs can be reduced by indicating where certain levels of ribes could be tolerated or areas where antibiotic treatment of pine would not be necessary.

Management also wants to know what air flow conditions prevail in areas where long distance spread may be involved. When basic criteria for long distance spread can be recognized variable width of protective zones can be established on working units and unfavorable areas avoided.

By Merle G. Lloyd, Meteorologist
Inland Empire Research Center
Intermountain Forest & Range
Experiment Station

A. Antibiotic Treatment of Infected White Pine

1. Results of 1958 tests of Acti-dione and cycloheximide derivatives

a. Basal stem method. Tests compared concentrations, additives, diluents, effectiveness of time of application in relation to seasonal period of tree growth, canker stage, translocation and persistence of antibiotic in tree, trunk, and branch portions sprayed.

(1) Concentrations. The persistence of Acti-dione in western white pine is governed to some extent by the concentration of antibiotic solution applied to trunks. To take advantage of a longer period of persistence while keeping costs commensurate with expected benefits from a higher concentration, 150 ppm Acti-dione is recommended for basal stem treatment throughout the 1960 season. This revision in early season formulation instructions has no bearing on the immediate effectiveness of the 120 ppm Acti-dione formulation used in 1959.

(2) Additives. Triton X-155, a nonionic polyether alcohol-type compound, used to reduce the interfacial tension between oil spray and bark surface failed to increase the effectiveness of 50 and 100 ppm Acti-dione. Bark injury resulted from adding this surface active agent to stove oil spray when treating trees during the flush period of growth. Being hygroscopic, Triton X-155 collects water by condensation which clog pumps at freezing temperature.

(3) Diluents. Petroleum cleaning solvent was compared with stove oil in the following proportions for Acti-dione carrier in treating pole-size western white pine.

Acti-dione ppm	Stove oil pints	Solvent pints	Damaging cankers Number	Damaging cankers % killed
50	8	-	18	94
	7	1	13	100
	6	2	17	100
	4	4	19	84
	-	8	22	77
100	8	-	18	100
	7	1	16	100
	6	2	20	100
	4	4	18	100
	-	8	17	71
200	8	-	15	100
	7	1	20	100
	6	2	16	100
	4	4	14	100
	-	8	19	84

(4) Effectiveness of time of application in relation to seasonal growth period of trees. Acti-dione effectiveness does not vary with flush, rest, and dormant periods of tree growth but growth period governs translocation of Acti-dione in trees. Cankers are usually killed the following spring when Acti-dione is applied in rest and dormant periods of tree growth. The more active the tree growth the more quickly Acti-dione is translocated.

(5) Canker stage. Acti-dione is equally effective on all canker stages of western white pine.

(6) Translocation and persistence of Acti-dione. Upward translocation and persistence of Acti-dione is evident from cankers dying over a 2-year period above the treated portion of trunks.

(7) Trunk and branch portions sprayed. Cankers were killed in vascular alignment when only one side of a trunk was sprayed. Decreasing the height which trunks are regularly sprayed decreases effectiveness of treatment. To assure Acti-dione translocation to distal branch cankers on the treated portion of trunks, basal portion of these branches must be sprayed as they have too short a trunk length from which to drain Acti-dione in its upward vascular tissue translocation.

b. Foliage sprays. Acti-dione, 100 and 200 ppm, stove oil and petroleum cleaning solvent solutions applied to foliage of 15-year-old western white pine killed from 40 to 60 percent of the trunk cankers and more than 95 percent of the branch infections. Results were slightly better from oil than solvent carriers, but oil was more injurious to foliage and

terminal shoots. Aqueous solutions of cycloheximide semicarbazone and oxime were less effective than oil and solvent solutions of Acti-dione in foliage spray tests.

c. Seedling immunization. Western white pine seedlings were successfully immunized from blister rust infection with semicarbazone, oxime, and acetate derivatives of cycloheximide. These derivatives in aqueous solutions were applied as a soil drench to potted pine seedlings that were then artificially inoculated by the rust. Multiple infections occurred on the untreated seedlings used as checks. These 1958-treated seedlings were again artificially inoculated with the rust in 1959. No additional antibiotic was applied.

2. Results of 1958 tests of Phytoactin and Phytostreptin antibiotics

a. Foliage spray. In June 1958 aqueous solutions were applied to 15-year-old trees during the period of most active growth. Phytostreptin was ineffective, whereas, Phytoactin killed a high percentage of trunk and branch infections as shown in the following test:

Phytoactin ppm	Branch infections		Trunk infections	
	Number	% killed	Number	% killed
100	7	100	11	55
200	8	100	14	71
400	6	100	11	82
800	9	100	10	80
Untreated	8	-	11	-

b. Slit method. To determine fungicidal activity, stove oil isopropanol solvent mixtures of Phytoactin and Phytostreptin were applied to incised trunk cankers on 15-year-old western white pine. Phytostreptin was again ineffective, whereas, Phytoactin killed a high percentage of trunk cankers.

Phytoactin ppm	Trunk infections	
	Number	% killed
100	10	80
200	12	91
Untreated	11	-

3. Antibiotic tests in 1959

a. Aerial application. Acti-dione, cycloheximide semicarbazone, and Phytoactin antibiotics were aerially applied by helicopter on the St. Joe National Forest, June 2-3. Fourteen 10-acre plots were sprayed - 10 with Phytoactin, 3 with semicarbazone, and 1 plot with Acti-dione LC-657. Concentrations of 100, 200, and 400 ppm Phytoactin were

applied to mature, pole, and sapling-size stands. A tenth plot in cutover was sprayed with 200 ppm Phytoactin. Semicarbazone, 100, 200, and 400 ppm, and Acti-dione LC-657, 100 ppm, were applied to trees in a 25-year-old plantation. Phytoactin was an aqueous solution and, semicarbazone and Acti-dione a 10% oil emulsion. Ideal weather conditions for aerial application prevailed for the two days of spraying. Treatment results will be based on 100 trees in each plot that were carefully selected to assure active trunk and branch infections.

b. Basal stem method. A statistically designed study consisting of 138 cycloheximide (Acti-dione) formulations was established in a pole-size plantation, Kalispell Creek, Kaniksu National Forest. Purpose of study is to compare Acti-dione forms, solvents, and additives to improve the effectiveness of the basal stem method. Each formulation was applied to 50 diseased white pines, the total number treated in the test being 6,900 trees. Cycloheximide derivatives tested included: semicarbazone, acetate, acetoacetate, oxime, thiosemicarbazone, and methylhydrozone. Spray was applied by a Kaniksu National Forest antibiotic crew.

Basal stem tests with Acti-dione were made on mature-size trees from 16 to 24 inches d.b.h. Trees will be cut and cankers examined in 1960. Phytoactin concentrate diluted in stove oil was tested on sapling and pole-size trees. Hortesin, a new antibiotic, was applied by the basal stem method, also.

c. Translocation and persistence of Acti-dione. Utilizing both bioassay measurements and paper chromatographic identification, it was found that Acti-dione is absorbed, persists, and is translocated upward in western white pine. Needle, bark, and secondary xylem samples were collected at intervals varying from $\frac{1}{2}$ day to 2 years after tree treatment. These were sent to Kalamazoo, Michigan, for extraction and analysis by The Upjohn Company. The antibiotic was found to persist for at least two years in the trunks of trees treated by the basal stem method. Acti-dione applied only to the lower trunk area was later recovered from needles of unsprayed branches. Movement was through the water-conducting elements since the antibiotic could be detected in xylem tissue both at and above the site of application but it was never detected in bark tissue above the treated area of the trunk.

d. Seedling immunization. Tests to immunize white pine seedlings from blister rust infection by antibiotic treatment were continued in the Coeur d'Alene nursery. Phytoactin, and the cycloheximide derivatives (semicarbazone and thiosemicarbazone) were applied as a soil drench to several hundred potted 1+, 2+, and 3+-year-old seedlings. These were artificially inoculated in October with blister rust inoculum from infected

ribes. Another test was initiated in which roots of seedlings were dipped in an antibiotic slurry, then replanted. Slurries were prepared from the derivatives of cycloheximide. Phytoactin slurry treatment will be tested in 1960.

e. Cooperation. In Glacier National Park, basal stem and foliage spray tests with Acti-dione and Phytoactin on whitebark and limber pines were continued. Acti-dione basal stem treating crew work on western white pine in 1959, and 1958 tests on whitebark and limber pines were inspected with Dr. William Klomparens, In Charge, Agricultural Research and Development, The Upjohn Company, Kalamazoo, Michigan. The results of the 1958 tests on whitebark and limber pine were encouraging. Final results will not be known until 1960, due to the very short seasonal period of tree growth.

In southern Oregon, assistance was given Region 6 in initiating antibiotic tests on sugar pine. The Umpque and Rogue River National Forests were visited to inspect and evaluate results in applying Acti-dione by the basal stem method to western and sugar pines. Fungicidal activity of Acti-dione on sugar pine infection appears to develop more rapidly than on western white. Possibly the difference is in the total volume of spray delivered to the basal trunk areas of the two species. More spray is required to visibly saturate the rough, scaly bark of sugar pine from the smooth bark on trunks of similar size western white pine.

The Upjohn Company personnel visiting the region for office and field conferences in 1959 were as follows: Dr. William Klomparens, Head, Agricultural Research and Development, Mr. Jack Northam, Statistician, and Mr. Rocco Lipari, Agronomist. Acti-dione and cycloheximide derivatives, and 7,000 numbered plastic tree tags for experimental tests were donated by The Upjohn Company, Kalamazoo, Michigan.

Pabst Brewing Company personnel visiting the region for office and field conferences in 1959 included: Dr. Alex Sigal, Technical Director, Pabst Brewing Company, and Dr. Jack Ziffer, Head, Department of Microbiology, Pabst Laboratories. Phytoactin material for the helicopter tests and backpack sprayer application experiments were donated by the Pabst Brewing Company, Milwaukee, Wisconsin.

B. New Chemicals Tested for Control of Ribes, Brush, and Weeds

Brush killer-type chemicals field and laboratory tested on ribes in 1959 included the following: (1) forron 2,4,5-trichlorophenoxyacetic acid propylene glycol butyl ether esters, (2) 20% active 2,4,5-T grandular silvex on attaclay, (3) forron 2,4,5-T silvex high emulsifier, and (4) urox granular 3-(p-chlorophenyl)-1, 1-dimethylurea trichloroacetate. Forron 2,4,5-T silvex high emulsifier was applied to Ribes lacustre by regular spray crew in Potter Creek, Coeur d'Alene National Forest. This formulation precludes mixing stove or diesel oil in aqueous solution for late season spraying.

Two surface active agents to increase wetting and penetration of aqueous and oil solutions of 2,4,5-T were tested. These additives were (1) HCA hexachloracetone, and (2) Lebcol T-40, a low viscosity, non-volatile fat derivative. HCA is toxic to grasses. More rapid knockdown of ribes foliage resulted in adding these surface active agents to 2,4,5-T spray solutions.

Results of chemical tests in 1958 are as follows: (1) trichlorobenzoic acid was less effective than 2,4,5-T at identical acid equivalent levels. Ribes were killed only if they were crown drenched with trichlorobenzoic spray solution. Conifers were moderately to highly susceptible to Benzac. (2) Pelletized trichlorobenzoic acid was effective on seedling ribes only. Grandular and pelletized forms of Benzac will be further tested for ribes control on broadcast burns in 1960. (3) 2,4,5-T invert emulsion killed approximately the same percentage of ribes in late season spraying as a 10% oil emulsion of 2,4,5-T. However, it has its disadvantages in that mixing must be done carefully and mixes kept fresh. High viscosity of invert emulsions limits the distance they can be forced through hose lines by power sprayer. Also, thickness of emulsions make them difficult to apply with trombone pump sprayers. (4) Oil emulsion 2,4,5-TP in 10% stove oil was about as effective as 2,4,5-T acetic acid when applied to ribes in late season. (5) Simazine 50W was tested for weed control in nurseries. It accomplished good weed control but injured conifers by leaching to root zone levels. Simazine is an effective soil sterilizer for permanent weed control on non-cultivated lands.

Mr. Jack Fisher, Field Specialist, Agricultural Chemicals Development, Dow Chemical Company, was a visitor for office and field conferences on ribes and brush control problems in 1959. Chemicals for tests on ribes and brush were supplied by the following manufacturers: Dow Chemical Company, Midland Michigan, Amchem Products, Inc., Ambler, Pennsylvania and, Allied Chemical & Dye Corporation, New York, New York.

C. Status of Ribes Ecology Studies

Studies in integrating timber cutting and slash disposal practices with blister rust control were continued in cooperation with timber management and fire control staff officers on white pine forests, Inland Empire Research Center, College of Forestry, University of Idaho, and Potlatch Forests, Incorporated. Several prescribed control broadcast burns and seed-tree cutting areas were being used to test new chemicals for ribes control.

By Virgil D. Moss, Research Forester

Tests in aerial application of antibiotics to develop a method for rapidly treating large acreages of infected white pines. Helicopter is applying 10 gallons of spray solution per acre to young pole stand, East Fork Potlatch Creek, St. Joe National Forest.

Antibiotic-treated western white pine seedlings in pots being artificially inoculated by diseased ribes in tests of immunity against blister rust infection. Tent enclosure and mist-type sprinkling system was used to establish moisture-temperature conditions favorable for pine infection.

Bark depression outlines dead trunk canker 6 weeks after treating tree with 150 ppm Acti-dione by the basal stem method. New growth causes bark to crack around canker margin.

A young western white pine treated with Acti-dione and fully recovered from blister rust. Note the two large cankers completely dead.

WHITE PINE BLISTER RUST

CANKERS KILLING YOUNG WHITE PINE

GIRDLING ACTION OF FRUITING CANKER

Panel No. 1 of Acti-dione display. Panel is 4' by 4'. Available for forest use.

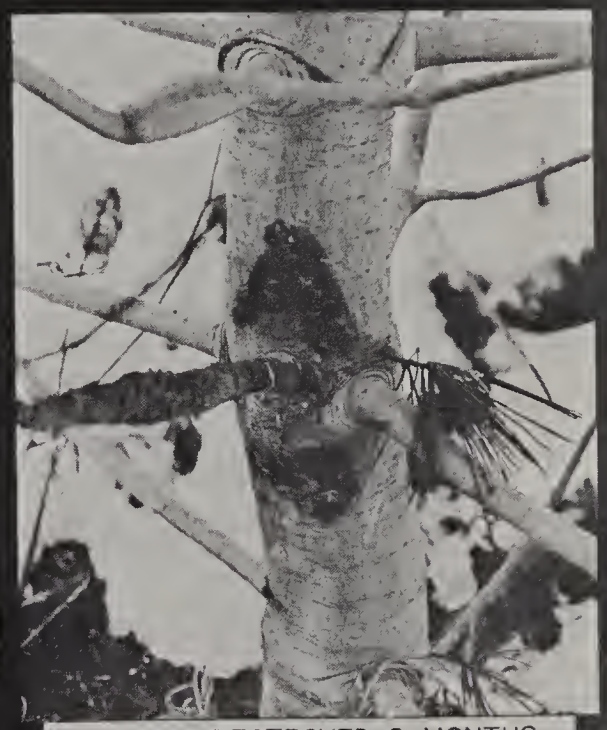
ANTIBIOTIC SAVES WHITE PINE

BASAL STEM METHOD

ALL POTENTIAL CROP TREES, HEALTHY & DISEASED, ARE TREATED

SPRAY APPLICATION OF ANTIBIOTIC ON WHITE PINE

PRODUCTION: 2 TO 3 ACRES PER DAY



FUNGUS DESTROYED 2-MONTHS AFTER SPRAYING

NEW TISSUE GROWING WITHIN 1-YEAR

HEALING ACTION 3-YEARS LATER

Panel No. 2 of Acti-dione display.

AIM AND OPERATION

DISEASED TREES SAVED WITH ANTIBIOTIC TODAY ASSURE GREATER WHITE PINE VOLUMES TOMORROW

FOREST CAMP IS CENTER FOR MAN POWER AND DISTRIBUTION OF MATERIALS

U.S. FOREST SERVICE

Panel No. 3 of Acti-dione display.

VIII. DEVELOPMENT OF RUST RESISTANT WHITE PINE, 1959

Genetics Center Completes First Year of Operation

The new Northern Idaho Forest Genetics Center completed its first year of operation in September 1959. This "shake-down" period saw the straightening out of many operational problems.

Dr. Burton V. Barnes, employed by the Intermountain Forest and Range Experiment Station, filled the vacancy left by Mr. A. E. Squillace, thereby renewing the work on improvement of growth and quality of western white pine. In order to undertake a full-time forestry curriculum, Mr. D. M. Romans resigned from the position of field and nursery work supervisor. He was replaced by Mr. Kenneth C. Wise, former Clearwater National Forest BRC camp-boss, forestry graduate and longtime greenhouse-nurseryman.

Breeding Work Continues

Controlled pollination work continued, again mostly with new rust resistant selections on the Bungalow, Kelly Creek, St. Regis, Wallace, and Kingston Ranger Districts. Through fall 1959, control pollinated seed from each of four test crosses on 63 new selections was already in hand. These 248 seed lots, along with 32 self-seed lots from the same trees, 10 control seed lots from presumably non-resistant trees, and 6 "standard" seed lots (progenies tested in previous years), totaling 296 seed lots, will be sown in a large progeny test in the fall of 1960. This first of the new series of F_1 progeny tests will be the largest sown to date.

About half of the seed for a 1961 progeny test involving another 60 new parents is already in hand. Another fair to good pollination year in 1960 will see the completion of test-crossing on these trees.

Thus, in three years (1959 through 1961) of intensive work we will be able to complete test-crossing on about 120 new selections. In the past, limitations imposed by lack of personnel and slower pollination procedures have resulted in testing only half this number of trees over a period of nine years. Therefore, production is at six times the former rate.

We will be searching for more new selections in 1960 and 1961. Suggestions as to the whereabouts of fairly large, accessible areas having extremely heavy natural infection, and where we do not have selections, will be most welcome. We are especially anxious to extend testing in the Kaniksu and south Clearwater areas.

A Seed Orchard is Born

James Hanover, in charge of seed orchard work for the Genetics Center, and Quentin Larsen of the Kaniksu National Forest, have been working on the establishment of the region's first seed orchard. The three photographs show the work accomplished so far in the establishment of the experimental seed orchard at Sandpoint, Idaho.

Beginning in the fall of 1958, progeny test data on progenies of the 60 trees then tested were scanned. Thirteen parents noteworthy for ability to transmit resistance to their seedling progenies were chosen for seed orchard use. In mid-December 1958, scionwood was collected from each of these good parents. In January and February 1959, with the help of three foresters detailed by the Kaniksu, St. Joe, and Clearwater National Forests, a 4- to 6-man grafting crew made 250 or more bottle grafts from each of the 13 selected parents, or a total of more than 3,400 grafts. The bottle grafts overwintered on double-deck benches in the Genetics Center greenhouse. Almost weekly care, including watering, weeding, fertilizing, spraying, and cutting back rootstock plants, continued throughout the winter until plants were moved outdoors into the lathhouse in mid-May 1959.

Meanwhile, personnel of the Kaniksu National Forest, had prepared 17½ acres of the Sandpoint Ranger Station pasture as a seed orchard site. Plowing, weed spraying, and cultivation started in the fall of 1958 and continued through 1959. In the fall of 1959, crews staked the area with large cedar stakes. These were spaced at 20 feet by 20 feet, in staggered rows, in preparation for planting grafted trees early in the spring of 1960.

Grafted trees will be planted in over 100 randomized blocks, each block containing one graft of each of the 13 clonal (parental) lines. Eighty of the blocks (1,040 plants) will be squared up in groups of 10 blocks, while odd corners of the planting will contain another 510 plants. These 1,550 grafted plants will be used to study problems in grafted seed orchard management, including fertilizing, watering, cultivating, and other treatments designed to induce early flowering and increase flower, cone, and seed yield. Incidentally, they will serve as excellent materials for appraising clonal variation in cone yield, growth rate, branching habit, bole and crown form, and other characteristics. From F_1 progeny tests already completed we expect that seed ultimately produced in the orchard will produce seedlings with 20 to 30 percent survival after repeated, intense inoculation with the rust fungus.

Heritability of Rust Resistance and Likely Rate of Gain

Recent heritability analyses show that resistance of western white pine to the blister rust disease is a highly heritable trait. The wild resistant trees contain the type of resistance genes which are "additive" in effect, i.e., by repeated selection and breeding the resistance genes and their effect can be accumulated, resulting in more and more highly resistant plants. Sixty-nine percent of the variation found in our F_1 progeny tests has been found to be of the additive genetic type, and we say, therefore, that heritability is 0.69 or 69%. This means that resistant seedlings chosen from those in rust exposure progeny tests will ordinarily be good materials toward increasing resistance in subsequent generations.

Heritability analyses also have a very practical value. Knowing the level of resistance in materials of a given generation, the heritability figure can be used to compute the likely rate of gain in subsequent generations. We have chosen as principal breeding materials a group of F_1 seedlings both parents of which exhibit general combining ability for a fairly high level of rust resistance. That is, the parents have demonstrated ability to cross with a number of other parents of the same type, consistently producing progenies in which a fair percentage of the F_1 seedlings survive repeated, heavy inoculations with the rust fungus. Progeny tests on about 60 trees show that about 1/5 of

these wild parents have the characteristic of general combining ability; the level of survival in their F_1 progenies is about 30 percent. Thus, F_2 breeding will "jump off" from a "platform" of 30 percent. The likely gain per generation (for a few generations thereafter) can be estimated merely by multiplying this 30-percent level by the heritability figure, 69 percent. The indicated gain is about 20 percent per generation, indicating that we should find certain F_2 progenies in which up to 50 percent of the seedlings survive.

New Time Schedule for Mass-Production of Resistant Planting Stock

Timber management and blister rust personnel have indicated that 50 percent survival constitutes a useful level of resistance for planting stock. Since the analyses indicate that stock of this caliber can be produced in only two generations of breeding work, we will probably be able to reduce our previous estimates of time required for mass production of acceptable stock. Our thinking in respect to future breeding toward this objective is as follows:

We have now completed tests on 60 parent trees, and about a dozen of these have the desired general combining ability characteristic - their progenies averaging 30 percent resistant. But inbreeding and adaptional considerations demand that we find more trees of this type. To prevent serious inbreeding an individual seed orchard should contain at least 20 to 30 different parents (clonal lines). Furthermore, a minimum of three orchards (representing low, middle, and high elevation seed source) must be established. With only a dozen good trees in hand, this means that we will have to find another 50 good trees to meet the minimum requirement of 20 trees for each of three orchards. This in turn means that we will have to test F_1 progenies of about 250 more wild resistant trees, since only 1/5 of the wild trees prove to have the desired characteristic of general combining ability.

The F_2 generation should contain certain progenies averaging 50 percent resistant. This gain can be verified on an experimental level by testing F_2 progenies from crossings made among surviving F_1 seedlings of earlier tests. All of these selected F_1 seedlings are now preserved in the Moscow Arboretum. Work toward verification of the 20 percent gain in the F_2 generation, and the testing of F_1 progenies of the 250 new trees can proceed simultaneously. Both jobs should be near completion in about 10 years, or by 1970.

Meanwhile, we will have preserved in the Moscow Arboretum all surviving F_1 seedlings, both parents of which are known to have general combining ability for rust resistance. Present estimates are that from both old and new F_1 tests we should be able to accumulate about 2,500 such seedlings. By 1970 these seedlings should range from 3 feet up to 20 feet in height. If resistance in the F_2 seedlings increases as predicted, establishment of the seed orchards can proceed immediately. A requirement of 10 million plantable seedlings per year is anticipated, and it is estimated that 100 acres of seed orchard will be required to fulfill this objective. Half a dozen approach grafts from each of the 2,500 preserved F_1 seedlings will produce 10,000 grafts necessary to plant the 100 acres of seed orchards. Eventually these grafts from F_1 plants will bear flowers and cross naturally. Since all were chosen for general combining ability, the general run of F_2 seed thus mass-produced should provide 50 percent resistant stock. If the orchards are established around 1970, they should begin production of significant amounts of F_2 seed by 1980 to 1990. Our previous time schedule for mass production of acceptable seed showed this objective being reached in the year 2010.

Work on Associated Projects Continues

Dr. Barnes is continuing work in flower induction, selective fertilization, seed production, and the inheritance of growth rate and timber quality of western white pine.

Studies on inheritance of growth rate continues to be the major project. Squillace and Barnes have recently completed heritability analyses for this trait. Since growth is a complexly inherited character (one probably influenced by a great many different genes), heritability is lower than found for rust resistance (i.e. approximately 15 percent).

Early results from a second selective fertilization test indicate that selfing in seed orchards may be significantly reduced. In effecting fertilization self pollen is apparently at a disadvantage when in competition with pollen from other trees. This finding may allow us to reduce the number of clones required to prevent serious inbreeding in seed orchards.

Induction of early flowering and increasing seed yield in improved wild stands (seed production areas), in seed orchards, and in breeding arboreta, continues to receive attention. It is beginning to appear that with western white pine the best way to secure early and heavy flowering is to keep the seedling on its own roots and give it "the works" in respect to protection, watering, cultivating and fertilizing. Factorial experiments covering all combinations of these treatments are in progress.

By Richard T. Bingham, Research Forester

The Sandpoint Experimental Seed Orchard Site, October 1959, staked 20' by 20' and ready for planting in the spring of 1960.

A portion of the 3400 bottle grafts of rust resistant white pines destined for the Sandpoint Experimental Seed Orchard.

Bottle grafting rust resistant western white pines in the Northern Idaho Forest Genetics Center greenhouse.

IX. MECHANICAL DEVELOPMENTS FOR WHITE PINE BLISTER RUST CONTROL - 1959

Hand Sprayers and Tools

Specialized equipment development included improvement of the No. 100 AL sprayer made from sand cast aluminum ends and irrigation tube connecting sections. O-rings are used as seals at the tube ends to close them to oil and air leakage.

Leading manufacturer's compression sprayers were tested to determine their adaptability for tree trunk spraying using Acti-dione. The Hudson No. 335B-Climax, Hudson No. 291C-Booster, and Dobbins No. 145-A gave the best results.

Alterations were necessary on some of these sprayers to improve their performance: adding oil-proof hose, providing dust guards, and nozzle orifice reductions made the sprayers do a more efficient job.

Several styles of packboards were tested for carrying the compression sprayers. They were also used in transporting stove oil to the spraymen in the field. Steel straps were secured to replace the leather and web formerly used to mount compression sprayers on packboards. Latest of these are the pair of 18-gage galvanized steel straps with an attached rest to support the sprayer when filling.

A small cast chrome steel ribes pick was tested for strength and hardness and is now available at reasonable cost. Continuous Casting Company, 5607 Corson Avenue, Seattle 8, Washington, is the manufacturer.

Power Sprayer and Service Trucks

The photos show part of the functions of a service truck. The Gorman-Rupp 2-inch pump acts as a suction filler at the stream, circulates the spray mix while en route to the power sprayer, and transfers the solution to the several sprayers it services within a local area.

Shown in the photo is a flat style Conten-steel hydraulic agitated slip-on or quick mount, power sprayer. Illustrated is a Bean Model 603-F, fastened to the forward section of the tank. The sprayer is bolted to wooden skids. Four high pressure outlets are provided.

Nozzle Flow Tests

All tests were run with a Dobbins #145 sprayer using No. 1 stove oil. Sprayer pressure was checked each time before rerun of nozzle flow. All tests were run twice to check on possible error. On each test nozzle caps were closed and then opened just enough to allow free passage and maximum vermoil atomization of the oil spray.

TEST #1--DOBBINS NOZZLE, #82 Cap, bored .040 orifice.
Sprayer pumped to 25 p.s.i. gage pressure.

Filled 3-inch beaker in 30 seconds; 2½-inch and 5-inch in 60 seconds (1-1/5 pints per minute).

TEST #2--HUDSON MULTI-SPRAY NOZZLE WITH FAN SPRAY CAP, #1540-5.
Sprayer pumped to 25 p.s.i. gage pressure.

Filled 3-inch beaker in 30 seconds; 3-3/4-inch and 7½-inch in 60 seconds. (1-4/5 pints per minute).

TEST #3--HUDSON MULTI-SPRAY NOZZLE WITH CAP, #1347-6, bored .052 orifice.
Sprayer pumped to 25 p.s.i. gage pressure.

Filled 3-inch beaker in 30 seconds; 2½-inch and 5-inch in 60 seconds (1-1/5 pints per minute).

Original tests run at Coeur d'Alene indicated that the Dobbins No. 82 nozzle cap flows 7 percent more oil with .048 orifice than Hudson cone cap with .052 orifice. The Dobbins #82 cone cap was filled and rebored to .040 orifice.

The Hudson cap 1540-5 fan spray cap will discharge 3 barrels of oil while the cone spray nozzles discharge 2 barrels.

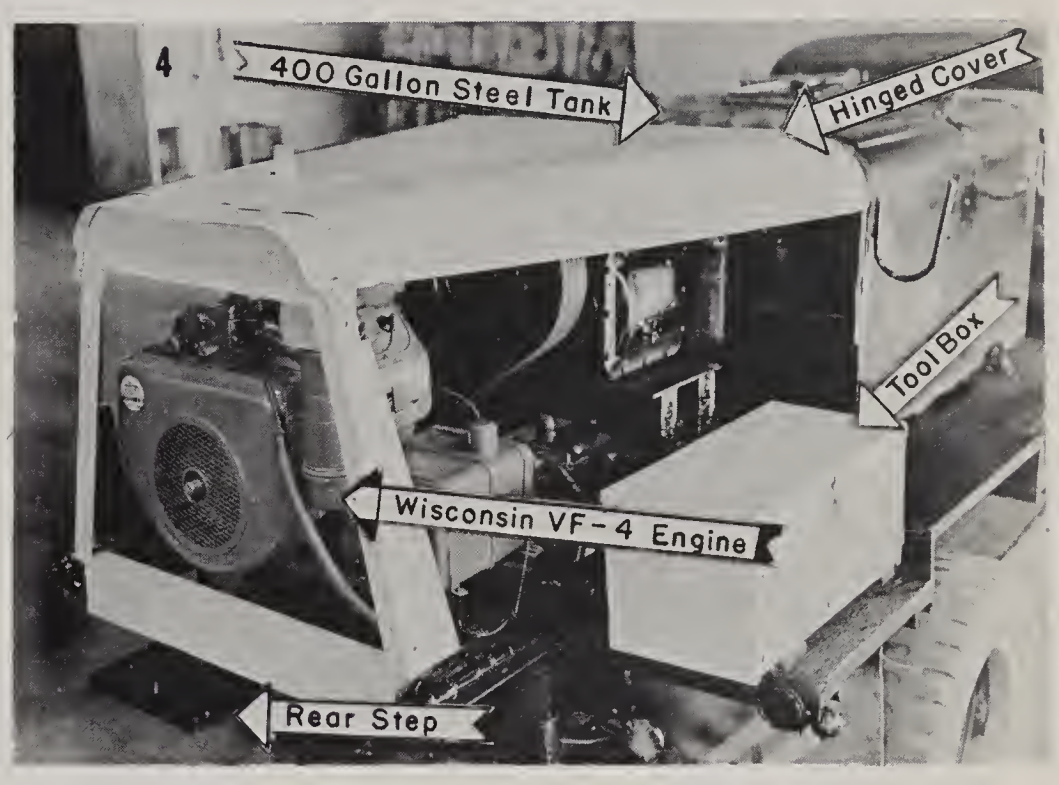
The flow rate of the Hudson 1540-5 fan nozzle is very close to the flow of the Hudson 1347-6 cone nozzle with .060 orifice. (Old test rates show flow of .052 orifice was 65 percent of original .060 orifice).

By J. F. Breakey, Mechanical Engineer

SPRAYER and SERVICE TRUCKS

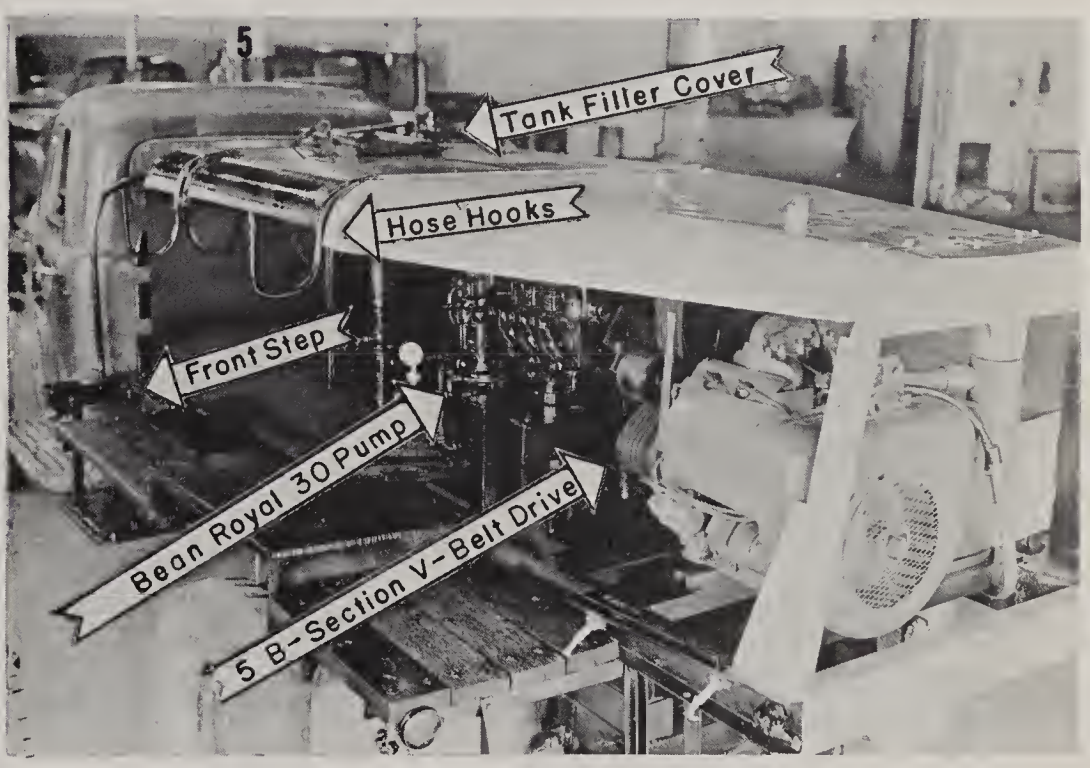
SERVICE TRUCK

SLIP ON TRUCK SPRAYER



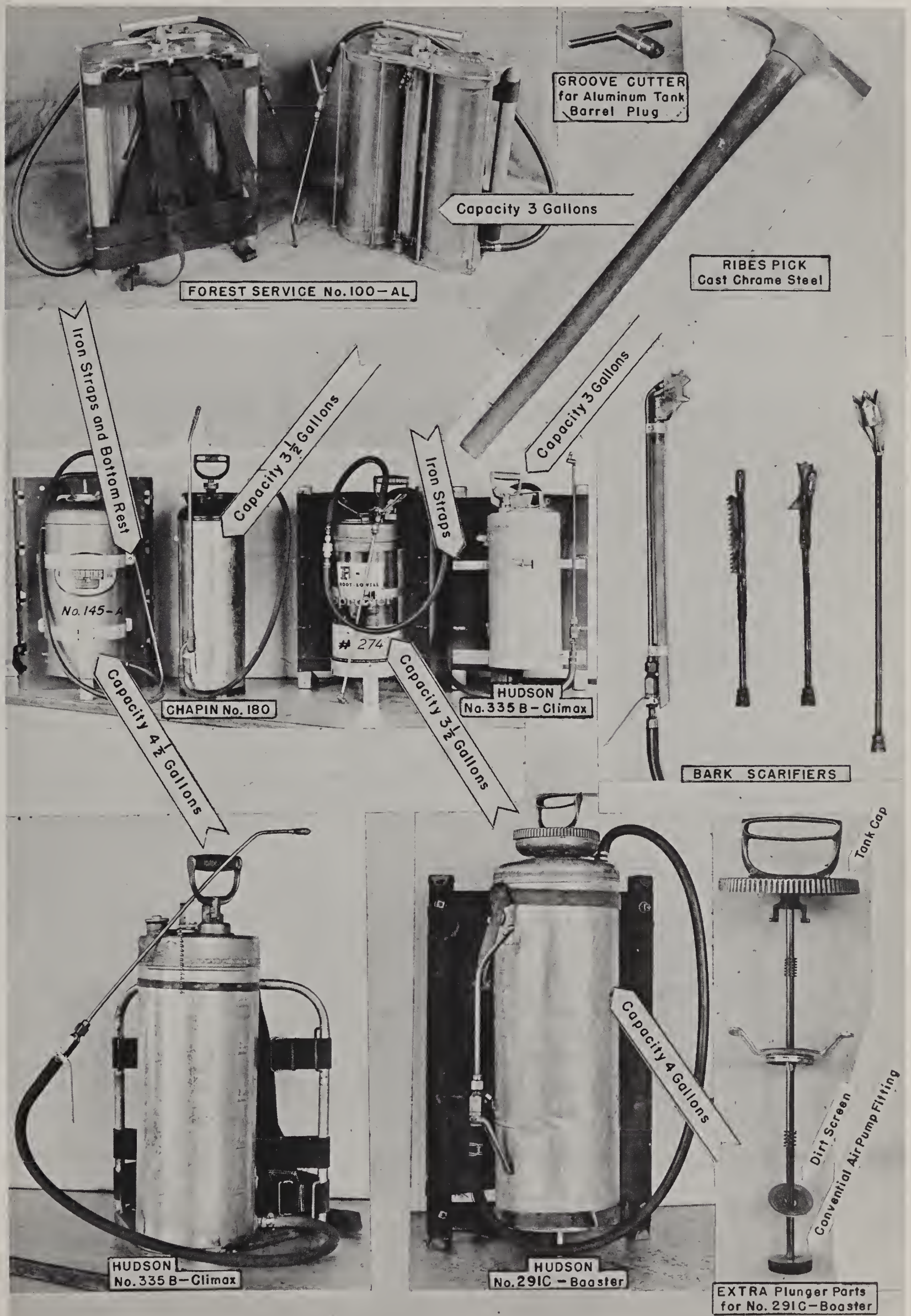
RIGHT SIDE VIEW

SPRAYER ANCHORED to TRUCK



LEFT SIDE VIEW

HAND SPRAYERS and TOOLS



X. APPRAISAL OF BLISTER RUST DAMAGE TO MERCHANTABLE WESTERN WHITE PINE STANDS ON CLEARWATER AND ST. JOE NATIONAL FORESTS

This is an appraisal of white pine blister rust (Cronartium ribicola Fischer) damage to merchantable western white pine on the North Fork of Clearwater River of the Clearwater National Forest and the upper St. Joe River Drainage of the St. Joe National Forest. Some two billion board feet of young mature (120-140 years) white pine are involved on the Clearwater and slightly less than one billion board feet on the St. Joe.

Blister rust infection of the pine host enters through the needles. The resultant canker grows and develops in the bark of the infected portion and under favorable conditions, will eventually reach the bole. A girdling action results in the death of that part of the tree above or beyond the canker. Injury to a tree may result from either or both of two types of infection: (1) simple twig or branch infections which kill only these small portions; and, (2) infection that eventually enter and girdle the main bole causing the death of the entire crown above that point.

Infections of the first type sometimes become sufficiently numerous to result in death of the tree through the killing of individual branches or branch tips. No method has been developed whereby the time required for tree death from multiple branch killing can be predicted.

A knowledge of canker growth rates and general behavior of the rust, however, make it possible to predict the time required for injury to result from those cankers which will eventually reach and girdle the bole. If such cankers enter at or near the base of the crown, the entire tree is killed when the bole is girdled and the top flags. When such cankers enter the bole well above the base of the crown all parts above that point are killed. Such injury greatly reduces the volume of foliage, thus lowering the vigor of the tree. Death will occur through continued downward growth of the canker after it has girdled the bole. Death may also occur to such trees through lack of direct sunlight on remaining live foliage. It is the consideration of injury resulting from cankers girdling the bole that the term damage is used throughout this report. However, the effect of simple defoliating cankers should not be completely ignored in figuring life expectancy of blister rust infected trees.

The young mature white pine stands under consideration became generally infected with blister rust during the period 1927 through 1936. For the most part, these stands have been continuously exposed to blister rust infection ever since the initial infection.

In 1936, Dr. T. S. Buchanan sampled 12 obviously heavily infected mature trees on Brown's Creek near Pierce, Idaho, on the Clearwater National Forest. The number of blister rust cankers found per tree ranged from 86 to 1,300, averaging 621 cankers per tree. He reported that this infection had nearly all occurred during 1928 through 1933; a period of 6 years. Only 1 canker out of 200 was estimated to be damaging. He predicted that damage would occur on the trees sampled in 15 to 20 years.

Portions of the area now in question on the Clearwater National Forest were covered by blister rust control crews during 1931 and 1932 and a major portion of the upper St. Joe Drainage was worked by blister rust crews in 1937. No blister rust work has occurred on any of these areas since the initial coverage. Due to a large reduction in control funds following 1937, all control effort was directed toward the protection of the more vulnerable, better stocked, highly productive, immature white pine stands; thus, a necessary calculated risk was taken that the present mature white pine stands would be harvested before being killed by blister rust. The younger a pine stand, the more quickly it is destroyed by blister rust.

In 1951, Richard T. Bingham made an intensive blister rust damage study of the young mature stand on Bird, Gold, and Simmons Creeks in the upper St. Joe River Drainage. Of the 268 trees sampled, 64 percent had bole cankers or had lethal branch cankers predicted as capable of reaching the bole. The time of death for the average lethally infected tree was placed at 1980. Many of the infected trees will live longer than 1980, but some are already dead while others will die in the near future.

In 1958 a blister rust damage survey was made on the young mature (120 years) stands of the Quartz Creek Drainage by St. Joe blister rust control personnel. This is a major drainage between Bird and Gold Creeks, previously mentioned, and should not be confused with the Clearwater Quartz Creek. A total of 530 trees were examined and it was found that 65.8 percent of the trees were lethally infected. It was reported that all lethally infected trees would be killed by 1988. The average life expectancy of the lethally infected trees is 19.7 years. One of the accompanying charts shows, by percentages of the total number of white pine trees presently in the stand, how much loss can be expected each 5-year period for the next 30 years in the Quartz Creek Drainage. There was a large variation in the percent of damage between survey lines (22.2% to 100%). The most severe damage was located within 5 chains on both sides of major streams. This 10-chain belt will be where the most immediate losses will occur. Throughout the drainage the intermediate and suppressed trees will be killed in most cases before the dominant and codominant. In general, the larger the tree the longer will be the elapsed time between infection and tree death.

In 1959 St. Joe National Forest personnel made blister rust damage survey of Gold, Tumbledown, and Eagle Creeks in the upper St. Joe River Drainage. A total of 1,778 trees were examined on 12,000 acres of the 120-140-year age class. Rust-damage findings were generally comparable to those reported by Richard T. Bingham and conditions found on the Quartz Creek Drainage of the St. Joe National Forest in 1958. The survey results showed that the most severe damage occurred in a 5-chain strip on both sides of all major streams and in the heads of drainages. Trees in these severe damage belts are also the most heavily infected. Both Gold and Tumbledown Creeks will suffer major western white pine volume losses within the next 20 years, but Eagle Creek will lose the greater part of its pine volume within 15 years. The accompanying charts for respective drainages show, by percentages of the total number of white pine trees presently in the stand, how much loss can be expected each 5-year period for the next 30 years.

In 1958 BRC personnel conducted a blister rust damage survey of the Skull and Quartz Creek Drainages of the Clearwater National Forest. These western white pine stands are in the 121-140 age class. Some 1,268 trees were examined. Results of survey showed that 65 percent of the Skull Creek stand is lethally infected. Cougar Creek of the Quartz Creek Drainage averaged 34.7 percent and Lower Quartz Creek averaged 28.8 percent lethally infected. The average life expectancy of the lethally infected trees is as follows: Upper Skull Creek, 17 years; Lower Skull Creek, 13 years; and, Cougar and Lower Quartz Creeks, 14 years.

The procedure that is used to determine the life expectancy of blister rust infected mature trees is covered on pages 91 through 97 of the 1951 blister rust control annual report for Region 1. In Buchanan's study, all trees were felled. In Bingham's study, all trees were inspected by climbing. All other surveys were by observation from the ground with 7 x 50 binoculars. When the surveys were made from the ground with binoculars, only bole cankers are tallied. Potentially, lethal branch cankers were not tallied. Thus, the percent of damage is conservative in all surveys made in 1958 and 1959.

In all 1958 and 1959 mountain pine beetle and blister rust damage surveys made by the forests, field data was taken to determine if the mountain pine beetle had any preference for blister rust damaged mature trees over so-called healthy trees. The data from the 3 separate surveys made showed that the mountain pine beetle had no preference for blister rust damaged trees over undamaged trees. There was no correlation between mountain pine beetle infestations and blister rust infection; however, the role of secondary beetles in blister rust damaged mature stands is not known. They will not be beneficial.

It must be strongly pointed out that the blister rust damage picture in the mature stands of the upper St. Joe and the North Fork of the Clearwater River does not apply to all mature western white pine stands of the Inland Empire. The early introduction and heavy build up of blister rust infection on the Clearwater and St. Joe National Forests was due mainly to the abundance of the highly susceptible, wild black currant (Ribes petiolare). The northern limits of this ribes species is the southern edge of the Coeur d'Alene National Forest. Thus, all of the Kaniksu and Kootenai and nearly all of the Coeur d'Alene National Forests were free of this ribes species. While unprotected mature stands on the Kaniksu, Kootenai and Coeur d'Alene are now infected with blister rust, the degree of infection is not as heavy nor as old as that reported for the St. Joe and Clearwater National Forests. The 1928 through 1936 blister rust control work in the mature stands of the Clearwater and Potlatch Timber Protective Association was successful in delaying the build-up of rust infection. The same applies to portions of the St. Joe and Clearwater National Forests.

It may be possible to stop some of the current rust damage through aerial application of antibiotics. Antibiotics were aerially applied by helicopter on mature trees in 1959. Results of these tests will be known in June 1960.

Much of the white pine in question will need to be harvested at an early date to prevent heavy volume losses due to blister rust. Timber access roads are the only sure answer to the problem. Periodic insect and disease surveys must be made to aid in directing cutting as to time and place. The degree of damage will vary by drainages and areas within a drainage. Special timber marking and cutting guides need to be developed. Top regional priority should be given the harvesting of the stands in jeopardy.

By Homer J. Hartman, Forester
Division of State & Private Forestry

QUARTZ-ENTENTE CREEK, ST. JOE NATIONAL FOREST

Results of Mature Western White Pine Blister Rust Damage Survey - 1958

Percent of total trees now in the stand that will be lost due to blister rust.

Period	5%	10%	15%	20%
1959 to 1964	Est. Vol. 1.7MM Value: $59,000	5.5%		
1965 to 1969	Est. Vol. 1.1MM Value: $38,500	3.8%		
1970 to 1974	Est. Vol.: 3.8MM Value: $133,000	12.6%		
1975 to 1979	Est. Vol.: 3.8MM Value: $133,000	12.8%		
1980 to 1984	Est. Vol.: 4.1MM Value: $143,500	13.6%		
1985	Est. Vol.: 5.3MM Value: $185,500	17.5%		

Total loss that will occur within the next 30-year period is 65.8%. The estimated volume loss represented by this figure is 19.8 million board feet. ($35 per M stumpage)

GOLD CREEK, ST. JOE NATIONAL FOREST

Results of Mature Western White Pine Blister Rust Survey - 1959

Percent of the total trees now in the stand that will be lost due to blister rust.

Period	5%	10%	15%	20%	25%
1960 to 1965	Est. Vol.: 6MM Value: $180,000	6.6%			
1966 to 1970	Est. Vol.: 5.9MM Value: $177,000	6.5%			
1971 to 1975	Est. Vol.: 13.3MM Value: $399,000	14.67%			
1976 to 1980	Est. Vol.: 12.4MM Value: $372,000	13.7%			
1981 to 1985	Est. Vol.: 9.1MM Value: $273,000	9.97%			
1986	Est. Vol.: 20.3MM Value: $609,000	22.3%			

Total loss that will occur within the next 30-year period is 73.74%. The estimated volume loss represented by this figure is 67 million board feet. ($30 per M stumpage).

TUMBLEDOWN CREEK, ST. JOE NATIONAL FOREST

Results of Mature Western White Pine Blister Rust Survey - 1959

Percent of the total trees now in the stand that will be lost due to blister rust.

Period	5%	10%	15%	20%	25%
1960 to 1965	Est. Vol.: 1.84MM Value: $55,200	8.2%			
1966 to 1970	Est. Vol.: 1.04MM Value: $31,200	4.64%			
1971 to 1975	Est. Vol.: 3.35MM Value: $100,800	15%			
1976 to 1980	Est. Vol.: 4.6MM Value: $138,000	20.6%			
1981 to 1985	Est. Vol.: 2.67MM Value: $80,100	11.9%			
1985	Est. Vol.: 3.58MM Value: $107,400	16%			

Total loss that will occur within the next 30-year period is 76.3%. The estimated volume loss represented by this figure is 16 million board ffet. ($30 per M stumpage).

EAGLE CREEK, ST. JOE NATIONAL FOREST

Results of Mature Western White Pine Blister Rust Survey - 1959

Percent of the total trees now in the stand that will be lost due to blister rust.

Period	5%	10%	15%	20%	25%
1960 to 1965	Est. Vol.: 4.9MM Value: $147,000		14%		
1966 to 1970	Est. Vol.: 3.5MM Value: $105,000		10%		
1971 to 1975	Est. Vol.: 8.9MM Value: $267,000				25.7%
1976 to 1980	Est. Vol.: 5.4MM Value: $162,000		15.7%		
1981 to 1985	Est. Vol.: 4.5MM Value: $135,000		12.9%		
1986	Est. Vol.: 3.7MM Value: $111,000		10.6%		

Total loss that will occur within the next 30-year period is 88.86%. The estimated volume loss represented by this figure is 30.9. ($30 per M stumpage).

RESULTS OF BLISTER RUST DAMAGE SURVEY OF MATURE WESTERN WHITE PINE
IN THE SKULL AND QUARTZ CREEK DRAINAGES - 1958
Clearwater National Forest

Drainage		Height feet	DBH-inches	Tree condition		Lowest lethal canker measurements					Estimated years of life after top flagging	Total years until death
				Number without bole cankers	Bole lethally infected	Height above ground feet	Trunk diameter	Estimated years until top flagging	Live crown canker: Feet of live crown above canker	Live crown canker: Feet of live crown below canker		
Upper Skull	Trees Examined	296			195							
	Average	136'	21.8	101	65.8%	111'	7.4"	8	23.5	47.6	10.2	18
	Range	80'-240'	12"-68"			65'-175'	2"-16"	0-19	3'-70'	5-80'	0-15	0-32
Lower Skull	Trees Examined	343			211							
	Average	125'	22.1	132	61.5%	100'	6.3"	6	21.6	50.3	7.5	13
	Range	60'-160'	12"-42"			45'-160'	2"-16"	0-17	0'-60'	10'-90'	0-15	0-29
Cougar Creek	Trees Examined	386			128							
	Average	120	21.1	240	34.8%	103'	5.9"	6.4	14.8	41.1	7.9	14
	Range	70'-165'	12"-34"			60'-155'	2"-12"	0-13	5'-40'	5'-80'	0-15	0-28
Lower Quartz	Trees Examined	229			66							
	Average	125	21.9	163	28.8%	102'	5.9"	6	15.9	36.6	9.2	15
	Range	70'-165'	12"-32"			70'-130'	2"-12"	0-15	5'-60'	0'-50'	0-15	2-30

XI. COST ANALYSIS OF BASAL STEM APPLICATION OF ACTI-DIONE IN THE TREATMENT OF WESTERN WHITE PINE FOR THE CONTROL OF BLISTER RUST - KOOTENAI NATIONAL FOREST - 1959

Antibiotic treatment of western white pine for control of blister rust is relatively new. Hand application method of Acti-dione treatment on the project basis was done in the region during 1957 and 1958. This year is the first time the basal stem method of Acti-dione treatment was done on a project basis on this forest. It is felt that the areas worked were of typical working conditions and representative of the areas that will be treated by this method. Good records were kept and the following cost analysis is presented as a record as to actual cost of treatment. Since the use of antibiotics and their application is relatively new, this can be used as a guide to management in future planning.

Areas

Twelve hundred and ninety acres were worked, and of this total 630 acres were plantations and 660 acres in 2-pole stands in the 60-80-year age class. Plantation areas are as follows: 240 acres planted in 1945, 150 acres planted in 1949, 140 acres planted in 1951, and 100 acres planted in 1954. All plantation areas had been clearcut, burned, and planted.

Working Conditions

General. Of the total acreage worked, the average maximum distance from the road or supply point was 20 chains.

Plantations. A good clean burn had been obtained on plantation areas prior to planting. Primary obstacles on 80% of the areas were logs remaining after burn. Twenty percent of the total area supported heavy brush cover. Plantation areas average 500 trees per acre. Average slope is 30%.

Pole Stands. The 2-pole stands average 250-300 trees per acre. They are mixed stands with hemlock and cedar as associated species. Stands resulted from a heavy burn followed by heavy natural reseeding. Areas are still covered with a large number of spindly suppressed trees as an understory to the larger trees. Area is steep with an average slope of 100%.

Method

For most of the work the crew was composed of 10 men organized into a foreman, supply man, and 8 spraymen. A 500-gallon trailer tank was used to mix the solution and was located on the road adjacent to area being worked. Fuel oil was delivered direct to trailer by bulk oil dealer. Solution was back-packed to spraymen by packboard in 5-gallon jeep cans. Acti-dione formulation was 120 ppm prior to August 1, and 150 ppm thereafter. All trees of good color and growth were treated regardless if infected or not infected.

Cost analysis		Cost per effective man-days	Cost per acre worked	Breakdown by percent
Wages - Crew, including holidays, annual leave, rainy days, training, social security -	$9,985.61	14.90	7.74	47%
Supervision, unit supervisor and camp boss, travel, holiday, annual leave	2,485.13	3.71	1.93	12%
Meals - Additional cost to appropriation @ 65¢ a meal	1,134.70	1.69	.88	5%
Equipment operation, repair and replacement	550.17	.82	.43	3%
Supplies	293.18	.44	.23	1%
Acti-dione	3,781.38	5.64	2.93	18%
Fuel oil	918.83	1.37	.71	4%
S.O. overhead, office, warehouse, etc.	2,112.92	3.15	1.64	10%
Sprayers, amortized over 10-year period. Total cost $331.00	33.10	.05	.03	-
Total	$21,295.02	31.77	16.52	100%

Under wages of supervision, the unit supervisor's time is included for supervising a crew of 5 men during a 6-week period in April and May, and 25% of his remaining time which was the proportionate share of his time spent with the 10-man crew during the summer months. This item also includes wages of foreman who was in charge of 10-man crew during the summer months.

This forest is on central subsistence account at a cost of $1.60 per meal. The 65¢ over and above the 95¢ deducted from the employee's wages is paid from project funds.

Effective man-days are days actually spent in the field on Acti-dione work.

Summary

Effective man-days for spraymen	520
Effective man-days for supervision	90
Effective man-days for supply man	60
Total effective man-days	670
Acres worked	1,290
Man-days per acre	.52
Number of trees treated	509,000
Trees treated per man-day	760
Trees treated per acre	395
Gallons of solution	4,990
Gallons sprayed per sprayer man-day	9.6
Gallons sprayed per acre	3.9
Trees treated per gallon of solution	102
Cost per effective man-day	$31.78
Cost per acre	$16.51
Cost per tree	.042

By Frank J. Kapel, Forester

XII. A METHOD OF ESTIMATING COST AND MAN-HOURS REQUIRED IN BASAL STEM TREATMENT OF WHITE PINE TREES BASED ON DISTANCE FROM SUPPLY SOURCE AND TREES PER ACRE

Introduction

In the basal stem application of antibiotics to western white pine trees there is a need for a method to estimate cost and man-hours required for treatment. Two major variables are, transportation of spray solution from supply source to point of application, and number of trees per acre. This study was made to devise a method of determining the cost and man-hours required per acre.

Methods

During the field season of 1959, cost records were kept on all Acti-dione treatment. Using these records as a basis, and with adjustments, assumptions and extrapolation, a table has been devised which can be used in work planning.

The results obtained are based on certain assumptions:

1. That the 1290 acres worked in 1959 represents an average work area. Of this total 630 acres were plantation, and 660 acres of pole in 60-80 year age class.

2. Slope, and working conditions on the area, such as windfall, brush, etc., was average.

3. Work was done by an average crew.

4. Road traversed area and spray solution was available on the road.

5. Figures are based on the efficiency of a 10-man crew.

6. Acti-dione formulation was 120 ppm prior to August 1, and 150 ppm thereafter. All trees of good color were treated.

7. Figures are based on areas averaging 350 acres or larger.

Adjustments were made in wages and in cost of spray solution by distance from supply source and number of trees per acre. Adjustments were made in the cost of wages as follows:

1. Cost of backpacking of spray solution by supply man from road to sprayman by 10-chain intervals from the road. This adjustment was made by estimating the time required for the man to pack from the road.

2. For labor in backpacking amount of spray solution by number of trees per acre.

3. For the travel time required for crew to walk from the road to work area by 10-chain intervals.

4. On time spent in labor spraying the tree with Acti-dione by number of trees per acre.

The cost of Acti-dione and fuel oil was adjusted for number of trees per acre.

Results

In the following table, cost figures were computed on the basis of $31.75 per effective man-day.

It is evident from a study of the table that man-days per acre is only an expression of total cost of treatment. Man-day per acre does not reflect man-hours actually worked by the man in the field. This can be explained in that the smaller the number of trees per acre the cost of chemical is less, and this can be a compensating factor in higher cost of labor. In comparing two areas which have the same total per acre cost, it is probable that man-hours of work required will be different.

In most ribes eradication work, man-days per acre was a true expression of both cost and labor involved. This can be explained in that labor was the major item.

Conclusion

On this forest, white pine stocking becomes noticeably less progressing up slope in the drainage. Areas can be separated at every 10 chains away from the road, and number of trees per acre determined.

Use of Table

To obtain cost of treatment per acre, multiply cost of effective man-day by man-days per acre.

Use man-hours per acre to estimate work time required to treat an area.

By Frank J. Kapel, Forester in Charge
Kootenai National Forest

Man-days, Man-hours and Breakdown of Costs on a Per Acre Basis in Basal Stem Treatment of Western White Pine Based on Distance from Supply Source and Stocking.

Distance from road in chains	Unit of measurement per acre	Number of Trees Per Acre 0-30	31-70	71-100	101-200	201-300	301-400	401-500
0-10	Man-days	.28	.30	.32	.36	.42	.48	.54
	Man-hours	2.5	2.6	2.8	3.0	3.4	3.8	4.1
	Wages	$6.33	$6.66	$6.99	$7.62	$8.58	$9.54	$10.50
	Fixed cost	2.32	2.32	2.32	2.32	2.32	2.32	2.32
	Cost solution	.14	.47	.79	1.39	2.33	3.33	4.19
	Total	$8.79	$9.45	$10.10	$11.33	$13.23	$15.19	$17.01
10-20	Man-days	.29	.31	.34	.38	.45	.52	.58
	Man-hours	2.7	2.8	3.0	3.3	3.8	4.2	4.7
	Wages	$6.78	$7.20	$7.61	$8.39	$9.58	$10.77	$11.96
	Fixed cost	2.32	2.32	2.32	2.32	2.32	2.32	2.32
	Cost solution	.14	.47	.79	1.39	2.33	3.33	4.19
	Total	$9.24	$9.99	$10.72	$12.10	$14.23	$16.42	$18.47
20-30	Man-days	.32	.35	.38	.43	.51	.59	.67
	Man-hours	3.0	3.3	3.5	3.9	4.6	5.2	5.9
	Wages	$7.70	$8.28	$8.85	$9.93	$11.58	$13.23	$14.88
	Fixed cost	2.32	2.32	2.32	2.32	2.32	2.32	2.32
	Cost solution	.14	.47	.79	1.39	2.33	3.33	4.19
	Total	$10.16	$11.07	$11.96	$13.64	$16.23	$18.88	$21.39
30-40	Man-days	.34	.37	.41	.47	.56	.65	.74
	Man-hours	3.3	3.6	3.9	4.4	5.1	5.9	6.7
	Wages	$8.38	$9.08	$9.77	$11.07	$13.06	$15.05	$17.04
	Fixed cost	2.32	2.32	2.32	2.32	2.32	2.32	2.32
	Cost solution	.14	.47	.79	1.39	2.33	3.33	4.19
	Total	$10.84	$11.87	$12.88	$14.78	$17.71	$20.70	$23.55

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

REPORTS

ANNUAL REPORT

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN CALIFORNIA

FOR THE CALENDAR YEAR 1959

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA REGION
1959

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A N N U A L R E P O R T

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THE BLISTER RUST CONTROL PROGRAM - 1959

A PROGRESS REPORT

By

Neil J. MacGregor, Forester

During 1959 the U. S. Forest Service continued in its role of over-all coordinator for all blister rust activities in California. Active control programs were conducted by the Forest Service on State, private, and national forest lands, and technical assistance was provided by the Service to the National Park Project. The work, largely ribes eradication, was performed in 19 of the northern and central counties and involved 11 national forests, three national parks, one State forest and numerous private holdings. Cooperators include the California Division of Forestry, the California Division of Beaches and Parks, the National Park Service, the University of California and many representatives of the State's timber producing industry.

In all, about 46,000 acres were treated during the year. The ribes eradication job, which was performed mainly under contract, resulted in the removal of nearly 3,500,000 ribes plants. Pine delineation surveys were made on 9,000 acres under consideration for inclusion in sugar pine management units. In addition, progress was made in the development of rust-resistant sugar pines, and the further testing of antibiotics for the direct treatment of blister rust infection.

THE STATE COOPERATIVE AND NATIONAL FOREST PROJECTS

Since the technical demands of both the State Cooperative and the National Forest Projects are very similar and frequently involve intermingled lands, the two projects are administered as a single activity by national forest personnel. Staff assistance and technical direction are provided by the California Division of Forestry and the Forest Service Regional Office.

In commercial forests blister rust control work is conducted on areas that have been designated as sugar pine management units and dedicated to the sustained production of high quality sawtimber. These units are selected on the basis of economic criteria that include such factors as productive capacity of the land, sugar pine stocking, anticipated yield, and the total cost of intensive management. The cost of blister rust control is included as only one of the several expenses of intensive management.

The State Cooperative Project is a joint effort of the State of California, the Forest Service, and numerous individual land owners. Present protection units include about 11,000 acres of State land and 205,000 acres of privately

owned commercial forest land. The State assumes full financial responsibility for work on its lands and matches federal appropriations and owner contributions for work on private holdings. Individual owners are encouraged to contribute up to 25 percent of control costs. The sugar pine management units on national forest lands now total about 265,000 acres. Control work is financed wholly by federal appropriation.

RIBES ERADICATION

Blister rust control in California is accomplished chiefly through the eradication of ribes (wild gooseberries and currents) from the protection units. Chemical herbicides in liquid and pellet form are used to a limited extent, but the principal eradication method remains hand pulling. The bulk of this work is performed under contract. In 1959 the average price paid to contractors was $8.27 per acre. Approximately 21,000 acres on national forest, State, and private land were worked by contract this year, and an additional 2,000 acres were treated by hired crews and inmate labor. Roughly two-thirds of the work was reeradication. Initial work accounted for almost one-third and maintenance about one percent of the total. Nearly 81,000 acres were covered by strip surveys.

RUST-RESISTANT SUGAR PINE

Beginning in 1957 an active genetics program aimed at the ultimate production of sugar pine that will be highly resistant to blister rust has been conducted as an important phase of the State Cooperative and National Forest Projects. The work consists of locating naturally resistant trees in heavily infected stands outside of control units, selecting through controlled cross-pollinations those which will best transmit the resistance to their progeny, and finally establishing seed orchards for the production of rust-resistant seed.

The administration of the program was transferred this year to the newly established Placerville Nursery on the Eldorado National Forest, where other tree improvement programs in the Region are being conducted. Technical assistance is furnished by the Division of Timber Management and the Pacific Southwest Forest and Range Experiment Station. Three new rust-resistant candidates were located this year and the program of releasing and fertilizing previously discovered candidates was continued. Preliminary results of fertilization as a means of stimulating cone production as well as increased vigor are encouraging. Fertilizer is now being applied on a two-year schedule.

Twenty-two crosses using pollen from 12 candidates were made and wind-pollinated seed was collected from seven trees. About 300 successful grafts from resistant candidates will be outplanted for further exposure to blister rust and for preservation of parent stock in the spring of 1960. It is expected that the more vigorous understock now being produced at the Placerville Nursery will result in a higher proportion of successful grafts than has been possible in the past. Two outplanting sites, one on the Eldorado and one on the Klamath National Forests have been selected. Future plans call for an accelerated program of cross-pollination and testing of the progeny.

DIRECT CONTROL

In the past direct control, the treatment of individual infected trees, has been used to a very limited extent in California. It consisted chiefly of pruning trees on which the infection had not yet reached the bole. The recently developed antibiotics, Acti-dione and phytoactin, offer the possibility of wide-scale treatment of lethally infected trees.

In Region I where most of the developmental work was carried out, methods have been developed that allow use of antibiotics on an operational basis. The species treated there is western white pine.

Beginning this summer a comprehensive program of testing these antibiotics and other fungicides on sugar pine was undertaken in California. The field work was conducted by the Klamath National Forest and followed a detailed plan prepared by the Pacific Southwest Forest and Range Experiment Station. Staff assistance was provided from the Regional Office. Field activities consisted of ten tests on the Shasta and 28 on the Klamath National Forests. In all, 436 trees were treated. Kerosene and stove oil were used as diluents and several fungicides, in addition to the two antibiotics, were applied in various dilutions and by several methods. A two-man crew performed the work.

The Gualala Peak infection center (see below) was inspected this fall by Regional Office and State officials, and the first of a series of administrative tests of the basal-stem Acti-dione treatment was established. The purpose of this series is to determine the effectiveness of the method at the extreme range of sugar pine. Acti-dione applied in stove oil as a basal-stem treatment was used to a limited extent on the Plumas, Lassen, and Shasta-Trinity Forests as a supplementary direct control measure within management units. Some direct control through pruning of infected limbs and the removal of lethally infected trees was also done on these Forests. Approximately 2,000 infected trees were pruned and 300 others having bole cankers were cut.

RUST SPREAD

The southern limit of rust spread in the Coast Range was extended 75 miles with the discovery of blister rust cankers on sugar pine near the Gualala Peak fire lookout (State) in Mendocino County. The infection center which was reported by California Division of Forestry personnel is thought to be of 1937 origin. It is far outside of any protection unit and no control work is planned. In the Sierra Nevada the disease continued to intensify locally, but no infection beyond the previously known limit was reported. The southernmost penetration of the disease here is Dodge Ridge in Tuolumne County.

THE NATIONAL PARK PROJECT

The National Park Project in California is a cooperative activity involving both the U. S. Forest Service and the National Park Service. In general, control work is administered by the National Parks with the technical assistance of the Forest Service and the National Park Service Regional Office. Protection units which have been established on all of the National Parks within the State now total more than 160,000 acres and include outstanding stands of foxtail, white bark and western white pine in addition to sugar pine. Initial coverage of the units is now 96 percent complete and 73 percent is on maintenance.

During 1959 nearly 7,000 acres in all three Parks received treatment. The work was divided about evenly between reeradication and maintenance with only eight percent being initial eradication. Almost 90 percent was performed by hired crews, the remainder by contract. Approximately 70 seasonal technicians and laborers were employed. Ribes surveys were made on 42,000 acres. A small amount of scouting for blister rust was done and about 2,000 acres of pine delineation surveys were made.

Increased emphasis on maintenance work characterized the work on all Parks this year. About half the seasonal employees were technicians engaged primarily in maintenance work, and the bulk of the 42,000 acres of survey work was in maintenance areas.

LASSEN VOLCANIC NATIONAL PARK

A six-man maintenance crew covered 5,000 acres in the Juniper Lake and 2,000 acres in the Manzanita Lake areas. Initial work on 354 acres in the Little Hot Springs area was completed by contract. This very nearly completed all presently scheduled initial work on the Park. About 1,400 acres of white pine were delineated in the Devils Kitchen area, a portion of the Park being considered for possible inclusion in the protection unit.

YOSEMITE NATIONAL PARK

A single 40-man camp operating out of Crane Flat was engaged in reeradication and maintenance work in the Bald Mountain and Crane Flat Units. The camp consisted of a 15-man checking crew which completed about 1,800 acres of work in maintenance and light-population reeradication areas, and a 25-man eradication crew which covered 500 acres of difficult reeradication in the cut-over area west of Crane Flat. Private contractors worked about 300 acres of initial and heavy reeradication area near Aspen Valley. A small amount of scouting was done in the late fall. Neither blister rust nor pinyon rust was found.

SEQUOIA AND KINGS CANYON NATIONAL PARKS

A 20-man crew, half checkers and half laborers, working out of the Redwood Mt. camp completed scheduled reeradication and maintenance work in the Redwood Mt. and Grant Grove Units.

The Heather Lake and Rae Lakes Units were inspected and found to be in excellent shape. The Heather Lake Unit is on maintenance and was last worked in 1953. Very little ribes regeneration was found. In the portion of the Rae Lakes Unit which was worked initially in 1957 by chemical means a kill of better than 95 percent had been accomplished, and very few bushes had been missed. In 1960 the Park for the first time will have no low-country camp. The entire program for the season will consist of initial eradication in the unworked portion of the Rae Lakes Unit.

TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF DECEMBER 31, 1959

Ownership	Control Operation	Control Units		Status of Ribes Eradioation			
				Net Acres by Workings			Acres on Maint.
		Total Acres	Acres Unworked	Initial	Reerad.	Maint. Work	
WORK DONE BY THE STATE COOPERATIVE PROJECT							
PRIVATE LAND	Mendooino (Glenn County)						
	Klamath (Siskiyou County)	2,300		2,300	3,974	2,082	2,300
	Shasta-Trinity (Siskiyou and Shasta Counties)	5,028	822	4,206	2,985		220
	Modoo (Siskiyou and Modoo Counties)	6,706	3,224	3,482			
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)	97,688	19,818	77,870	86,428	1,206	44,263
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)	25,296	3,588	21,708	41,800		
	Tahoe (Sierra, Nevada, and Placer Counties)	2,141		2,141	941		
	Eldorado (Eldorado, Placer, and Amador Counties)	42,823	7,696	35,127	67,889		8,320
	Stanislaus (Calaveras and Tuolumne Counties)	8,112	316	7,796	18,309	20	1,724
	Sierra (Mariposa, Madera, and Fresno Counties)	14,422	1,285	13,137	10,933	66	620
	TOTAL	204,516	36,749	167,767	233,259	3,374	57,447
STATE LAND	Latour State Forest	2,355	172	2,183	1,829	41	674
	Blodgett Forest-Univ. of Calif.	940		940	2,793		
	D. L. Bliss-Emerald Bay State Parks	2,240		2,240			
	Calaveras Big Trees State Park	5,073	814	4,259	9,187		2,827
	Mountain Home State Forest	878	130	748	32		
	TOTAL	11,486	1,116	10,370	13,841	41	3,501
TOTAL STATE AND PRIVATE		216,002	37,865	178,137	247,100	3,415	60,948
WORK DONE BY THE FOREST SERVICE							
NATIONAL FOREST LAND	Mendocino	7,778	6,631	1,147	1,030		
	Klamath	2,238		2,238	2,326	765	2,238
	Shasta-Trinity	12,018	2,748	9,270	4,502		321
	Modoo						
	Lassen	24,174	8,207	15,967	11,497	312	4,390
	Plumas	62,525	14,778	47,747	69,579	395	2,066
	Tahoe	20,138	1,840	18,298	14,131		
	Eldorado	38,049	8,922	29,127	39,313	10	4,826
	Stanislaus	43,603	910	42,693	90,958	60	15,391
	Sierra	49,578	19,293	30,285	42,180	51	500
	Sequoia	4,974		4,974	3,473		486
	TOTAL	265,075	63,329	201,746	278,989	1,593	30,218
WORK DONE BY THE NATIONAL PARK SERVICE							
NATIONAL PARK LAND	Lassen Volcanic	25,847	103	25,744	26,780	2,064	17,779
	Yosemite	85,697	3,523	82,174	109,357	9,208	57,499
	Sequoia-Kings Canyon	50,576	2,632	47,944	59,661	8,322	42,667
	TOTAL	162,120	6,258	155,862	195,798	19,594	117,945
ALL WORK DONE IN CALIFORNIA							
ALL CONTROL OPERATIONS		643,197	107,452	535,745	721,887	24,602	209,111

SUMMARY OF RIBES ERADICATION IN CALIFORNIA - 1959

Ownership	Control Operation		Acres Worked (Contract And Camp Crews)	Acres Checked And Meeting Standards Without Work	Acres Total	Total Man Days	Thousands of Ribes Destroyed	Total Acres Checked (All Classes)	Contract Eradication: Acres Worked	Contract Eradication: Average Price Per Acre Paid to Contractor
WORK DONE BY STATE COOPERATIVE PROJECT										
PRIVATE LAND	Mendocino (Glenn County)									
	Klamath (Siskiyou County)		200		200	40	5	200		
	Shasta-Trinity (Siskiyou and Shasta Counties)		728	49	777	507	32	2,143	699	
	Modoc (Siskiyou and Modoc Counties)		870	259	1,129	345	53	2,255	765	$ 8.90
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)		3,034	2,195	5,229	891	127	8,551	2,437	8.77
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)		1,571	968	2,539	668	209	2,906	1,571	6.80
	Tahoe (Sierra, Nevada, and Placer Counties)		200	40	240	70	55	1,053	200	10.81
	Eldorado (Eldorado, Placer, and Amador Counties)		1,711	914	2,625	485	81	5,202	1,422	5.01
	Stanislaus (Calaveras and Tuolumne Counties)		884	397	1,281	198	117	1,644	864	6.44
	Sierra (Mariposa, Madera, and Fresno Counties)		387	270	657	129	43	4,611	363	7.11
STATE LAND	Latour State Forest		148	473	621	29	1	854	38	8.76
	Blodgett Forest-Univ. of Calif.		15	75	90	4	1	500		
	D. L. Bliss-Emerald Bay State Parks									
	Calaveras Big Trees State Park							1,374		
	Mountain Home State Forest							363		
ALL WORK DONE BY THE STATE COOPERATIVE PROJECT		Initial Work	2,883	1,642	4,525	1,045	257			
		Reeradication	6,645	3,998	10,643	2,279	461			
		Maint. Work	220		220	42	6			
		All	9,748	5,640	15,388	3,366	724	31,656	8,359	$ 7.43
WORK DONE BY THE FOREST SERVICE										
NATIONAL FOREST LAND	Mendocino		49		49	24	4	49	47	$14.26
	Klamath									
	Shasta-Trinity		1,716	262	1,978	921	90	3,317	1,660	
	Modoc									
	Lassen		1,513	672	2,185	824	167	4,519	1,415	9.56
	Plumas		1,517	1,526	3,043	814	298	5,868	1,466	9.42
	Tahoe		2,465	1,820	4,285	1,180	876	8,759	2,455	8.24
	Eldorado		1,922	1,544	3,466	693	262	5,481	1,685	5.26
	Stanislaus		1,623	2,083	3,706	416	306	4,796	1,563	6.88
	Sierra		2,651	622	3,273	1,364	506	16,022	2,599	10.28
	Sequoia		94		94	46	6	260	74	10.16
ALL WORK DONE BY THE FOREST SERVICE		Initial Work	4,433	1,277	5,710	2,451	751			
		Reeradication	9,051	7,252	16,303	3,819	1,762			
		Maint. Work	66		66	12	2			
		All	13,550	8,529	22,079	6,282	2,515	49,071	12,964	$ 8.31
WORK DONE BY THE NATIONAL PARK SERVICE										
NATIONAL PARK LAND	Lassen Volcanic		1,728	1,555	3,283	366	47	7,824	419	$21.37
	Yosemite		2,599		2,599	1,501	137	30,830	298	11.46
	Sequoia-Kings Canyon		2,350	286	2,636	654	59	3,630		
ALL WORK DONE BY THE NATIONAL PARK SERVICE		Initial Work	523	259	782	361	63			
		Reeradication	3,220	1,582	4,802	1,633	160			
		Maint. Work	2,934		2,934	527	20			
		All	6,677	1,841	8,518	2,521	243	42,284	717	$17.25
ALL WORK DONE IN CALIFORNIA										
ALL OWNERSHIPS ALL AGENCIES		Initial Work	7,839	3,178	11,017	3,857	1,071			
		Reeradication	18,916	12,832	31,748	7,731	2,383			
		Maint. Work	3,220		3,220	581	28			
		All	29,975	16,010	45,985	12,169	3,482	123,011	22,040	$ 8.27

C PW.

1380

Portland, Oregon
November 3, 1959

HIGHLIGHTS

ACCOMPLISHMENT REPORT

WHITE PINE BLISTER RUST CONTROL

C. Y. 1959

Region 6

C P W
W. V. B

Prepared by: Benton Howard, Forester

1380
Portland, Oregon

November 3, 1959

HIGHLIGHTS - C.Y. 1959
White Pine Blister Rust Control
Pacific Northwest - Region 6

The year 1959 was markedly different than previous years in that the promise of antibiotics in blister rust control work began to materialize.

The use of antibiotics to kill cankers throughout the crown of infected trees, coupled with the expected development of rust-resistant strains of western white and sugar pine may well change the present management concepts of these species in Oregon and Washington.

Ribes eradication on selected areas remained the demonstrated means of control in 1959. However, the progress made in the rust-resistant tree project and the encouraging preliminary results of the first major tests of the antibiotics indicate that the low levels of ribes suppression now necessary may no longer be required on many areas in order to grow white pine.

Three federal agencies are currently engaged in protecting western white or sugar pine stands from blister rust.

The Bureau of Land Management and the Forest Service are protecting selected commercial timber stands. Crater Lake National Park is protecting a stand of western white pine adjacent to Crater Lake. The results of the ribes eradication work and surveys are shown in the following tables:

SUMMARY OF SURVEYS - Calendar Year 1959

Agency	Acres Covered: Ribes	Damage	Pine Appraisal	Total	Man Days
Forest Service	17,019	1,562	300	18,881	660
Bureau of Land Management	11,229	-	-	11,229	356
Total	28,248	1,562	300	30,110	1,016

SUMMARY OF RIBES ERADICATION - Calendar Year - 1959

Agency	Class of Work	Land Ownership	ACRES Worked	ACRES Meeting Stds. w/o Work	ACRES Total	Man Days	Ribes Destroyed	Contract Work Acres	Contract Work Ave. Price	Chemical Acres	Chemical Gals
Forest Service	Initial	N. Forest	1185	648	1833	419	66	538			
	Reerad	" "	2350	1664	4014	1177	73	1213			
	Maint.	" "	93		93	5					
	All	Total	3628	2312	5940	1601	139	1751	$5.49	60	385
BLM	Initial	O & C	133		133	74	2				
		S & P	69	46	115	21	1				
		Total	202	46	248	95	3	132			
	Reerad	O & C	1430	1827	3257	684	44				
		S & P	654	221	875	358	38				
		Total	2084	2048	4132	1042	82	1939			
	Maint.	O & C	5630		5630	185	1				
		P. Domain	178		178	4					
		S & P	1219		1219	87	5				
		Total	7027		7027	276	6				
	All	O & C	7193	1827	9020	943	47				
		P. Domain	178		178	4					
		S & P	1942	267	2209	466	44				
		Total	9313	2094	11407	1413	91	2071	$6.62	10	8
ALL	Initial	N. Forest	1185	648	1833	419	66				
		O & C	133		133	74	2				
		S & P	69	46	115	21	1				
		Total	1387	694	2081	514	69	670			
	Reerad	N. Forest	2350	1664	4014	1177	73				
		O & C	1430	1827	3257	684	44				
		S & P	654	221	875	358	38				
		Total	4434	3712	8146	2219	155	3152			
	Maint.	N. Forest	93		93	5					
		O & C	5630		5630	185	1				
		P. Domain	178		178	4					
		S & P	1219		1219	87	5				
		Total	7120		7120	281	6				
	All	N. Forest	3628	2312	5940	1601	139				
		O & C	7193	1827	9020	943	47				
		P. Domain	178		178	4					
		S & P	1942	267	2209	466	44				
		Total	12941	4406	17347	3014	230	3822	$6.10	70	393

Because of the possibility of bringing established stands of white pine through to harvest by the use of Acti-dione, many private owners are showing much interest in this means of blister rust control.

Large scale operational tests were conducted on western white pine using the antibiotic (Acti-dione) as a basal spray on the Gifford Pinchot National Forest. Some 27,030 selected young western white pines on a 35-40 year-old-burn were treated using 150 PPM in no. 1 fuel (stove) oil. Only dominant and co-dominant trees were treated using procedures substantially the same as developed in North Idaho. An additional 4,692 western white pines adjacent to the campgrounds near Mt. Adams were also treated.

The Rogue River National Forest treated 9,095 western white and sugar pines during the season. Limited tests were made on the Umpqua National Forest. The Roseburg District of the Bureau of Land Management treated 732 western white pines and the Medford District treated 1,622 sugar pines.

No phytotoxicity was observed on the western white pines. Some damage occurred on some of the sugar pine treated during May with 200 PPM of Acti-dione. No phytotoxicity was seen on the sugar pines treated during July or August.

Following suggestions of Virgil Moss of R-1 and the Pacific Northwest Experiment Station personnel, additional tests of Acti-dione and Phytoactin on sugar pine were put out in September and October by the Forest Service and the Bureau of Land Management.

All tests will be evaluated during the summer of 1960. Following the evaluation, recommendations as to the use of these materials in Oregon and Washington will be made.

The work is summarized below:

Unit	Trees Treated	
Gifford Pinchot National Forest	31,722	Western white pine
Rogue River National Forest	9,095	Sugar pine and Western white pine
Roseburg District - (BLM)	732	" " "
Medford " - "	1,622	Sugar pine
Total	43,171	

The costs averaged about $0.075 per tree treated.

The program to develop rust-resistant strains of western white and sugar pine was continued during 1959. The principal achievements were:

Trees hand-pollinated on six (6) forests as follows:

Western white pine	No. of Trees	No. of Bags
Umpqua National Forest	14	63
Mt. Hood " "	3	19
Snoqualmie " "	3	15
Olympic " "	10	71
Total	30	168
Sugar Pine		
Siskiyou National Forest	2	20
Rogue River " "	1	12
Total	3	32

Plans called for placing 550 bags on the pines. However, due to the scarcity of conelets only about 250 were put on the trees. Many of the conelets were aborted before pollination which reduced the number of bags to 200. Pollen was scarce on western white and sugar pine in the spring which handicapped the work.

An additional 35 grafts made in 1958 from rust-resistant trees were placed in the Mill Creek Arboretum on the Rogue River National Forest.

A western white pine seed orchard was started at Jim Creek on the Rogue River Forest. Some 400 grafts from scions of the rust-resistant trees at Bohemia on the Umpqua Forest were made on established young white pine at Jim Creek. Several grafting techniques were used in order to test them for field use. In early October a survival count indicated that 36% were successfully established. This seed orchard will be used to produce western white pine seed for use by the Umpqua and Rogue River Forests. In addition, it will serve to facilitate work in testing rust-resistant candidates.

During 1959, an agreement was reached with the Bureau of Land Management for use of land below the Dorena Dam near Cottage Grove, Oregon, for the development of a rust-resistant seed orchard. Some 35 acres were cleared, plowed and fenced preparatory to planting western white and sugar pine understock for grafting on scions from rust-resistant trees growing in Oregon. This area will be used to facilitate the tree breeding work and the ultimate production of

seed from parents capable of transmitting rust-resistance. The work is being done by the Umpqua National Forest.

The Dorena Dam area under agreement with the Bureau of Land Management will be developed as a genetics center by several agencies--each working on land assigned to them. The participating agencies are the Bureau of Land Management, Region 6 of the U. S. Forest Service, the Pacific Northwest Experiment Station, the Oregon Forest Lands Research Center at Corvallis and Oregon State College.

At the Wind River Nursery on the Gifford Pinchot National Forest, western white pine seedlings have been planted to serve as understock for scions from rust-resistant trees growing in Washington. Objectives are similar to those at Dorena Dam.

The first hand-pollinated cones from rust-resistant white pines were collected at Bohemia on the Umpqua National Forest this fall. The seed will be processed at the Wind River Nursery and sown in seed beds there. Progeny testing will be started in 1960. Wind-pollinated seed also was collected from the Bohemia rust-resistant trees to be used in reforestation work at Windigo Pass on the Umpqua Forest.

Progeny testing of seedlings from wind-pollinated seed previously collected from the Bohemia rust-resistant trees was continued. The data have not yet been analyzed.

Prepared by: Benton Howard
Forester

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

WHITE PINE BLISTER RUST CONTROL

REGIONS SEVEN AND EIGHT

CALENDAR YEAR 1959

UNITED STATES DEPARTMENT OF AGRICULTURE

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WHITE PINE BLISTER RUST CONTROL IN THE EASTERN REGION

ANNUAL REPORT FOR 1959

United States Department of Agriculture

FOREST SERVICE

Region 7 Upper Darby, Pa.

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WHITE PINE BLISTER RUST CONTROL

U. S. FOREST SERVICE REGIONS 7 & 8

CALENDAR YEAR 1959

Control of blister rust on selected white pine stands in Regions 7 and 8 is a continuing program on lands of all ownerships. The program is founded on cooperation between states, local government agencies, private landowners and the Forest Service. In cooperative work, state agencies conduct the control work. The Forest Service provides overall direction, coordination and technical assistance and conducts control work on National Forest lands. Through the excellent cooperation of all participants, blister rust control has been integrated into a single effective program - regionwide.

Control of the disease is simple and effective. The disease cannot be transmitted from pine to pine but must be transmitted through an alternate host - currants and gooseberries. These plants are systematically destroyed where they grow in association with white pine stands that are of sufficient value to justify the cost of protection from blister rust.

OBJECTIVE OF BLISTER RUST CONTROL

The objective of blister rust control is to establish control of the disease and then maintain control by the most efficient and economical means until the white pine crop is ready for harvest.

SCOPE OF BLISTER RUST CONTROL IN REGIONS 7 & 8

Within the range of Eastern white pine in Regions 7 and 8 a total of 7.3 million acres of pine of sufficient value to justify blister rust protection has been mapped. To provide protection, ribes (currants and gooseberries) must be reduced to a safe minimum on 17.1 million acres of white pine and surrounding protection zone. Collectively the pine acreage and protective zone is referred to as control area. Approximately 88% of the control area is in State and private ownership; 11% is in National Forest lands and the remaining 1% is in National Parks and Indian lands.

ORGANIZATION AND COOPERATION

Control work is the responsibility of the State official designated by state law, the Forest Supervisor or Park Superintendent respectively on state and private lands, National Forest or National Park lands. The federal government provides technical assistance, coordination and financial aid to state and private cooperative programs and performs the control work on federal lands. The federal government discharges its responsibilities thru 21 district leaders supervised by three area leaders in the Division of State and Private Forestry, Region 7, U. S. Forest Service.

State and private cooperative work is financed by private, local and state funds supplemented by federal funds. Five states operate on a reimbursement basis. The other states operate through separate federal and state financing. The reimbursement procedures have enabled full time key personnel to be employed in some states. This has resulted in simplified employment and encourages more active participation and program direction by state cooperating agencies.

STATUS OF CONTROL

Control has been established on 93.3% of the 17.1 million acres designated for ribes eradication. Thus, the ribes populations on approximately 16 million acres has been reduced so that it presents no serious blister rust threat to the indigenous white pine crop. This acreage designated as "maintenance area" was increased by one percent over 1958 through 1959 field activities.

The white pine acreage and protection area is subject to contiued change. During 1959 there was a net increase of 5,000 acres of white pine. Most of the increase was due to natural pine regeneration on old abandoned farm lands and the active interest in tree planting. At the same time the total control area was reduced 133,000 acres. Timber harvesting, fire, wind damage and reduced protection boundaries accounted for this reduction. In localities where there are few or no ribes in the protection zone or where, due to ecology or micro-climates, the rust will not become a menace to the white pine before harvest, the control area is removed from future work plans. Over 230,000 acres were taken out of the projected workload schedules this year, bringing the total area in this category to 7,054,336 acres.

HIGHLIGHTS OF 1959

Scope of Operations

Surveys to determine pine conditions and to locate hazardous ribes populations were carried on in twelve states, four national forests and three national parks. The base control acreage receiving attention in 1959 amounted to 1,492,000 acres. These surveys are necessary to determine changes in pine distribution and to evaluate ribes conditions which may have developed during the interval between scheduled examinations. Most of this acreage was surveyed during the winter. Some of the area was re-examined when ribes were in leaf to further delineate areas requiring ribes eradication work. As a result of both winter and summer survey work a total 2.1 million acres were examined and 500,000 acres of this were mapped. A total of 11,083 man days were spent on surveys. Approximately 8½% of the basic acreage examined required intensive eradication work.

Ribes Eradication

Early spring was cool and wet. It was followed by hot humid weather in July and August. There was some early defoliation of ribes and in a few instances it curtailed control work. However, practically all planned work was achieved. Seasonal labor was plentiful and little turnover occurred. Most of the workers had previous experience and required a minimum of training in basic eradication methods. Peak employment reached 383 people in June.

Approximately 2.3 million ribes were destroyed on 128,286 acres that required intensive work. A total of 11,858 man days were used in eradicating ribes. Initial work was completed on 14;554 acres, rework was completed on 60,775 acres and 52,957 acres on maintenance were intensively worked. An additional 1.2 million acres on maintenance were examined which did not require intensive work. Thus only 4½% of the maintenance area examined required intensive work to reduce ribes populations to a safe level.

Of the total area receiving intensive eradication work, 91% was state and private lands, 7% was national forest land and 2% was national park land.

Nursery Sanitation

The sanitation zones of four nurseries were examined in 1959. All were forest tree nurseries. They were the University of Maine Nursery, Orono, Maine; Greenbush Nursery, Greenbush, Maine;

New Hampshire State Nursery, Boscowan, New Hampshire and the State Forest Nursery, Kentucky Lake, Kentucky. Only the Greenbush Nursery required intensive eradication. This nursery was recently established. Work this year completed initial coverage and some rework.

Chemical Eradication

Chemicals were used extensively this year to destroy ribes. A total of 12,000 acres were treated with 2,4,5-T. One and two quart plunger type sprayers were used more extensively in 1959 than during previous years. In general chemical eradication is less expensive than hand eradication and provides excellent ribes eradication. Large concentrations of thickly growing ribes were treated with back-pack power mistblowers. Treatment of R. cynosbati in Virginia and R. americanum in Pennsylvania gave excellent results. Considerable seedling growth occurred following treatment of R. glandulosum in New York. Several R. hirtellum concentrations were treated in Maine to determine the effectiveness of this type application on this species.

Checking

Approximately 1% of the acreage intensively worked on ribes eradication was checked. Of the area checked 48% was considered "good work" with less than 5 feet of ribes live stem per acre remaining. Thirty-two percent rated "average work" with 6 to 12 feet of ribes live stem and 20% was classed as "poor work" with 13 to 20 feet of ribes live stem per acre. All checks of completed work were within the allowable limit of 20 feet of live stem per acre that is considered acceptable for satisfactory work.

Standard procedures were established for checking the efficiency of scout work on areas examined for ribes conditions. Of 3,982 ribes sites examined by checkers, scouts had missed 272 sites for an efficiency of 93%. This type of check should result in better training of scouts. It could lead to more efficient and systematic scouting methods.

Infection Conditions

White pine stands under protection throughout the region show very little new infection. Small "hot spots" of infection have developed in a few places where ribes have not been promptly removed. Where control has been established and ribes eradication maintained the pine is in good condition.

Infection on ribes was reported light to medium with considerable early defoliation over most of the region. Weather conditions and observation of telial development indicate we should expect a light infection year. More systematic

observation of ribes infection was started during 1959. Efforts were made to sample the different ribes species at several locations throughout the range of white pine. Comparative inspections are planned to be made annually at the same locations.

Pine Conditions

White pine acreage continues to increase principally due to excellent restocking of cutover areas and the natural seeding of old fields to white pine. Planting programs under Soil Bank and other reforestation programs is likewise responsible for a part of the increase in white pine acreage. White pine will grow well on many soils and is favored for planting by many people. On many spoil bank plantings in the Pennsylvania coal mining localities, white pine survives and makes as good a growth as any other conifer.

Above average growth on white pine was reported this year in Maine and New Hampshire. An exceptionally heavy seed crop matured in New York. It was reported "spotty" in other states.

Informational Activities

Informational and service activities continued at a high level. Many private landowners, town selectmen and cooperating local government officials were conducted on "show-me" trips to observe at first hand, pine and blister rust conditions.

A new blister rust film is being prepared. This film "Eastern White Pine - Good Management, More Profit" includes blister rust control as one of the management requirements to profitably grow white pine. Area Leader John R. George acted as technical advisor during the filming of the scenes. The completed film will be available early in 1960.

Safety

On the job safety training and safety meetings were continued as an integral part of BRC operations. One vehicle accident of a minor nature marred an otherwise perfect record. Only one lost time accident occurred during the year.

BRC Handbook

A new handbook for blister rust control was started and a rough draft completed. Field personnel were given an opportunity to review and test it during the summer. The handbook was carefully reviewed in November and final preparation should be completed by mid-summer 1960.

White-Pine Weevil

The white-pine weevil (Pissodes strobi) always a serious problem is now considered by many as the number one enemy of white pine

management. Blister rust by virtue of the control established has slipped into second place. Weevil damage has been reported on the increase from Maryland south to North Carolina. District leaders have assisted in damage appraisals in New York and Pennsylvania.

Weevil-like damage

In many localities especially in New England and New York the terminal bud failed to grow. This results in a weevil-like damage to the white pine. In 1955 this phenomena was reported quite widespread in Maine and New Hampshire. At that time the most plausible explanation was believed to be extra seasonal growth. When this occurs the tree metabolism is disturbed and may result in forking when the terminal bud does not grow normally.

Oak Wilt

Blister rust personnel in Area III assisted in oak wilt control in West Virginia, Kentucky, the George Washington and Jefferson National Forests. Area Leader George coordinated oak wilt survey work between the National Forests and the Virginia Forest Service.

IMPROVEMENTS AND DEVELOPMENTS IN BLISTER RUST CONTROL

Chemical Control

Invert 2,4,5-T was applied to ribes on a test basis in each of the BRC areas. Results cannot be evaluated until after the 1960 growing season. Preliminary observations indicate it may be superior to the conventional formulations in general use. It sticks and penetrates better, serves as a marker for an hour or more and shows reaction on ribes within a few hours. Invert 2,4,5-T has a serious disadvantage in that mixing it with oil and water requires exacting care and procedure to produce the desired discosity.

Back-pack, power mistblowers were used on heavy concentrations of ribes with good results. Test applications with the power mist-blower were also made with both regular and invert 2,4,5-T formulations on R. hirtellum in heavy swale grass in Maine. These ribes present a difficult and costly eradication problem.

Acti-dione

Following the outstanding success of killing blister rust cankers on western white pine with the antibiotic Acti-dione BR, tests were outlined for Eastern white pine. Approximately 1,000 eastern white pine trees were treated with Acti-dione Br. Formulations varied from 50 to 350 ppm of Acti-dione BR in #1 fuel oil (kerosene). Applications of Acti-dione-BR were made as a basal treatment to the tree or as direct application to the blister rust canker. Some cankers were incised and others were not.

At present results indicate:

(1) Acti-dione BR in kerosene in formulations of 50 to 350 ppm show little or no toxic effect on Eastern white pine.

(2) Solutions of all strengths seem to have some effect on the rust pathogen. Higher dosages show the most effect on early observations.

(3) Rough bark trees apparently absorb more of the active ingredient than smooth bark trees. Blister rust cankers on the rough bark trees show effect earlier from Acti-dione BR treatments.

(4) The basal treatments compare favorably with the direct application treatments of the antibiotic to the blister rust cankers.

(5) Some additional rodent damage has been noted on treated trees and black turpentine beetles seem to be attracted more readily to treated trees.

First inspections indicate approximately 70% of all treated cankers were either arrested or dead. Since killing of the cankers occurs over a two year period or longer the results at this time should be considered only as indications. Much work and testing needs to be done before definite recommendations can be made as to dosage and use of Acti-dione BR on Eastern white pine.

HIGHLIGHTS OF THE BRC WORKSHOP

A blister rust workshop was held during the week of November 16-20 at Blackwater Lodge, Davis, West Virginia. Approximately fifty-five people attended including BRC area and district leaders from Regions 7 and 8, state officials, state control aids, representatives from the Washington office, Northeastern Forest Experiment Station and Regions 7, 8 and 9. The meeting was highlighted by the attendance of four retirees who played an outstanding role in organizing and conducting blister rust control work in the early days. These were Dr. J. F. Martin, Dr. S. B. Detwiler, Mr. G. B. Posey and Mr. H. N. Putnam.

Mr. Allison opened the meeting with an introduction of these pioneers. Each gave a brief but interesting review of the early development of the blister rust control program. They mentioned the lack of trained personnel, the formation of cooperative state and federal programs and the ground work that was necessary to develop the present well organized control program.

Brief summaries of the main subjects presented for discussion at the meeting are as follows:

The Look Ahead in Pest Control - - - Roy W. Olson, Region 7

We are rapidly moving ahead and if we are to supply the timber products that will be needed by 1975 or the year 2000, pest control must play an important role. New problems and trends lead to research followed by pilot testing to develop control methods on an operational basis. In a highly complex field of endeavor, answers to many of the questions will come from such people as represented in blister rust control. Emphasis must be placed on the responsibility at all levels, from top administrators to land owners, to prepare for the critical years ahead which will decide if we are to realize the greatest return from our timber resources.

Pest Control, Region 8 - - - - - - - - E. R. Roth, R-8

The pest control section in Region 8 is in the Division of State and Private Forestry. It is organized with a Pathologist and Entomologist under the direction of a Section Chief. Region 8 has many forest pest problems. The yellow pine industry with large planting programs presents a variety of complex insects and diseases. Adverse publicity toward chemical control programs has had a marked effect on many people and must be counteracted by full and accurate information. Research is needed to ascertain the total impact of chemical controls but calculated risks must be taken where values are high.

BRC In Region 7 - - - - - - - - - - - P. H. Simmonds, R-7

See Highlights of 1959 in the annual report section.

BRC in Region 8 - - - - - - - - - - - - W. A. Stegall, R-8

In Region 8 white pine is being planted at a high level (7 million white pine planted in North Carolina alone). Planted pine continues to be the major control problem in North Carolina and Tennessee. More and more blister rust infections are found on unprotected and submarginal stands but the rust is not increasing in protected stands. Protection zones have been reduced to 300 feet on some plantations and is providing satisfactory protection. There is a need for better methods of evaluating pine stands other than stem count alone.

BRC Region 9 - - - - - - - - - - - - - D. A. Adams, R-9

Blister rust control in Region 9 is administered by the Section of Forest Pest Control in the Division of State and Private Forestry. Recently the National Forests have assumed full responsibility for the work on National Forest Lands. State and district leaders coordinate cooperative blister rust control.

Much work and study went into determining rust hazard zones for the Region. Contract eradication is used extensively in the region.

Cooperative BRC in West Virginia - F. Waldo Craig - State Entomologist

Accelerated white pine planting in the state has created a serious control problem. White pines have been planted without consideration of ribes populations. Owners then expected the state to perform ribes eradication. A policy was drawn up with the help of the State Forester and the BRC leaders. The policy for blister rust control to protect white pine plantations was reviewed. Highlights of the policy are:

(1) Land owners who plan to plant a minimum of two acres of white pine must apply for control measures if they desire these control measures to protect their plantings against loss from blister rust.

(2) Personnel of the cooperating agencies will make the examination of the planting site and determine the practicability of planting white pine seedlings.

(3) If such personnel determines that the necessary control work is reasonable and recommends the planting site, the control work will be done without cost to the landowner, providing funds are available.

(4) If planting of white pine is not recommended on a given area due to abundance of ribes species, or an unfavorable site, the landowner may proceed with the planting and receive control work providing he pays one-half of the control costs and further providing that public funds are available.

(5) Plantations established within existing blister rust control zones will be included in the scheduled contorl work for the zone.

The Use of Acti-dione in BRC - - - - - C. P. Wessela, W. O.

In Idaho, Virgil Moss has found that Acti-dione was very effective in killing blister rust cankers on Western white pine. Initial tests were made by applying Acti-dione in No. 1 stove oil (fuel oil) to cankered tissue. Later discoveries indicated that basal treatment of infected trees was equally as effective. Nearly four million Western white pine trees in Idaho were treated in 1959.

Acti-dione should be thoroughly tested on Eastern white pine. There is a very good possibility that it will control blister rust cankers on Eastern white pine. It will be necessary to find the right dosages. Blister rust control personnel should begin to analyze how Acti-dione control methods will fit into the control program for Eastern white pine.

Forest Pest Control in New York - - - - - - - - - - - C. J. Yops

The Department of Conservation is responsible for conducting all forest pest control work in New York. The Bureau of Forest Pest Control, Division of Forestry and Lands has responsibility for directing the work. Blister rust and Gypsy moth are the two major control programs. Each of these programs have pest control men located in the area of work. The pest control personnel are under the immediate supervision of a District Forester and a BRC District Leader. All blister rust control work is coordinated by the BRC District Leaders.

The white pine weevil is found throughout the range of white pine in New York. A survey has been started to examine the young stands of white pine and evaluate them for need of weevil control. New York has over 125,000 acres of red pine plantations. Since many of the stands are in need of thinning, a survey has been made to determine the amount of Fomes annosus present in the stands. The disease is so common and widespread that there is great concern about the problems. We are investigating all possibility for managing red pine to reduce Fomes annosus attack. It appears that, in the Northeast, red pine is more susceptible to being killed by this disease than are other native species of pine.

Acti-dione Tests on Eastern White Pine - - - P. H. Simmonds, R-7

There is sufficient evidence that Acti-dione has some effect on blister rust cankers in Eastern white pine. Inexperience in determining the action of this fungicide and the limited time since application has resulted in some variations in reported observations. More work must be done to develop effective formulations and application techniques. Present indications point to a basal treatment with higher concentrations than used on Western white pine. The problem of obtaining an oil from eastern distributors similar to the oil used in the West must be resolved. Tests will be made in 1960 using western oil on Eastern white pine.

From preliminary results of treating Eastern white pine with Acti-dione it appears that formulations can be developed that will be effective in killing the cankers on this species.

Microclimatic Studies - - - - Dr. E. P. Van Arsdel, L.S.F.E.S.

Microclimate and its relation to blister rust control is a complex study. Consideration must be given to proper forest management to reduce the blister rust control problem. Conditions of topography and forest cover have an influence on temperature, humidity and movement of air currents on a given site. Conditions

favorable for the transmission of viable spores will not be consistent for every site. Favorable conditions may be transitory, they may be affected by general weather conditions or, over a period of years, they may be changed by vegetative growth and shade conditions which originally produced favorable infecting conditions.

Studies have shown that infection is frequently heavier away from ribes sites. Thermal drafts may move upwards hundreds of feet before traveling horizontally. Infection hazards can be controlled by modifying sites, avoiding small openings and cooling spots. Infections are heavier in areas of lower average temperatures, such as river valleys or higher elevations that have increased rainfalls and a greater number of hours per day of saturated air in the form of fog. The shoulders of slope areas are the most frost and moisture free and therefore low in rust infection hazard. Tops of slopes, plateaus, and valley sites compare favorably in temperature and moisture ranges.

Eastern White Pine Economic Studies - - Dr. Carl Stoltenberg, NEFES

Economic studies of Eastern white pine propose to find the answer - "What will be the place of Eastern white pine in our future economic growth"? This will necessitate wide research in many lines and fields, part of which is in the area of blister rust control. Studies should provide a basis for estimating the size of budget necessary for overall control of white pine in the Eastern Region. They should also give a basis for determining where to spend the funds we have available. The cost of blister rust control must fall within the limits of the timber values saved. Studies will deal with money spent for timber stand improvement practices, pest control and compared values saved.

Consideration in evaluating control programs will be given to:

(1) Lumber markets, present and future.

(2) Stand conditions - site, stocking, overstory, age, current size, weevil attack rate, rust infection rates.

(3) Management variables harvest age (size) release cutting or treatment, thinning, weevil control, control of rust.

New Developments in BRC - - - - - G. R. Allison, R-7

In recent years there has been greater use of scouts, trained to do control area examination and locate ribes concentrations requiring intensive eradication. This has resulted in a more efficient control program and has reduced the need for unskilled seasonal laborers. There has been a reduction in the size of

eradication crews from five and six men to one, two or three - man units. These men confine their efforts to eradication of ribes concentrations previously located by the scout.

Aerial photography used extensively as an aid in developing maps has been a valuable tool in blister rust control work.

Blister rust control people have been continually looking for better ways of suppressing ribes. Considerable work has been done over the years in testing various chemicals as a means of killing ribes. It was not until the plant hormone type of chemicals became available, that reliable and economical suppression was attained. The chemical 2,4,5-T, now in general use, has proven very effective and reliable for killing ribes. Properly prepared and applied with care we can kill all species of ribes found in the Region, with little if any sprouting.

Development of suitable spray equipment has presented some problems. Types of equipment in general use include commercial sprayers ranging from 2-3 gallon pressure-type garden sprayers to small plunger - operated oilers. Some work has been done by individuals in developing "homemade" equipment designed for the purpose. Power operated back-pack mistblowers have been used to a limited extent. Results with the latter equipment are still to be determined.

During the past four years we have renewed our attention to ribes ecology - the relation of site, soil, moisture and climate on ribes occurrence and regeneration. About 300 plot studies have been made throughout the Region. If from these studies, we can single out some associated factors contributing to ribes regeneration, recognizable by the men in the field, we could greatly reduce the acreage that now requires periodic examination.

In the northeast a standard of 20 feet of live stem per acre after work has been considered satisfactory. We have had very little damage or pine loss where this standard has been attained. Under a maintenance program we find a large percentage of our control area ribes-free, or nearly so. Consequently the standard gradually lost its significance. We have placed increased reliance on the scout whereby he is primarily responsible for finding all ribes sites. As a result of these developments our standard for control was relaxed and the amount of checking greatly reduced.

To place a standard under our control work and provide a basis for better training, this year we tried a new approach to determining quality of control work. Intensively worked areas were checked and were judged on the maximum of 20 feet of stem per acre after working. The minimum amount of checking was set at 1% of the worked area. The examined area was checked to determine efficiency of the scout in locating all ribes sites. This required a definition and description of ribes sites which we attempted to provide. A goal of 10% of the unit areas

(roadblocks or grids) was set as a minimum accomplishment. Results of these checks were considered very satisfactory as determined from an analysis of check records.

Field Trips - - - - - - - - - - - - J. R. George, R-7

The program for the second day included a field trip to points of interest conducted by Area Leader George. These included the Clover Run Plantation and the Bennett Run infection area where Acti-dione plots have been established.

Considerable interest was shown regarding white pine growth at the Clover Run Area by those unfamiliar with white pine conditions in the Southern Appalachians.

On the Bennett Run Area observations were made of Acti-dione plots. Comparisons were made of cankers treated with the various formulas. There were different opinions expressed on the condition of the cankers and it was evident that more time is needed to determine the effectiveness of these treatments.

Spray Equipment - - - - - - - - - - L. R. Strickenberg, R-7

During the conference the various types of spray equipment used in chemical control of ribes were examined. Mr. L. R. Strickenberg demonstrated spray equipment used on brush control and emphasized the advantages of using good serviceable equipment with screw-type connections including proper nozzles, fittings and spray wands suited to the individual and the job at hand.

Mr. R. E. Curtis demonstrated the mixing of 2,4,5-Invert, a new formulation of the herbicide 2,4,5-T. He discussed its advantages and observed results of tests made on the various ribes species.

BRC Handbook Review - - - - - - - - - P. H. Simmonds, R-7

The remainder of the conference was spent in reviewing the BRC Handbook. Committees were assigned to review and discuss the various chapters and sections of the Handbook. Recommended changes were given in general meetings by Committee Chairmen. These recommendations were recorded for consideration in the final preparation of the Handbook.

APPENDIX

Statistical Tables

RIBES ERADICATION - 1959

Table 1

Regions 7 & 8

State Nat'l Forests Nat'l Parks	FIRST WORK Acres	FIRST WORK Ribes *	FIRST WORK Man Days	REWORK Acres	REWORK Ribes *	REWORK Man Days	MAINTENANCE WORK Acres	MAINTENANCE WORK Ribes *	MAINTENANCE WORK Man Days	ALL WORK Acres	ALL WORK Ribes *	ALL WORK Man Days
State and Private Lands												
Maine	482	89,545	285	1,492	139,771	496	1,970	181,083	666	3,944	410,399	1,447
New Hampshire	12	4,523	4	680	302,491	308	609	291,572	226	1,301	598,586	538
Vermont	4,895	71,727	295	3,308	44,796	228	8,945	30,331	223	17,148	146,854	746
Mass.	-	-	-	1,678	14,521	240	111	11,057	18	1,789	25,578	258
Conn.	-	-	-	-	-	-	235	46,871	53	235	46,871	53
New York	5,622	75,826	393	32,891	291,461	1,541	27,709	351,871	1,556	66,222	719,158	3,490
Penna.	70	2,633	14	355	12,455	49	1,139	36,592	269	1,554	51,680	332
Maryland	1,105	138,932	243	862	47,636	166	-	-	-	1,967	186,568	409
West Va.	509	2,576	71	11,669	66,464	1,564	5,449	11,357	642	17,627	80,397	2,277
Virginia	1,390	2,165	150	1,255	7,550	238	2,140	5,758	255	4,785	15,473	643
N. Carolina	469	7,543	59	48	1,340	5	-	-	-	517	8,883	64
Total - S&P	14,554	395,470	1,514	54,238	928,485	4,835	48,307	966,492	3,908	117,099	2,290,447	10,257
National Forests												
White Mtn. N.H.	-	-	-	1	106	1	-	155	-	1	261	1
Geo. Wash. W.Va.	-	-	-	1,098	5,441	141	160	490	24	1,258	5,931	165
Geo.Wash. Va.	-	-	-	3,280	18,126	620	1,754	6,872	254	5,034	24,998	874
Monongh. -W.Va.	-	-	-	1,847	7,706	248	655	1,539	94	2,502	9,245	342
Jefferson - Va.	-	-	-	311	3,601	56	350	3,204	64	661	6,895	120
Total - N. F.	-	-	-	6,537	34,980	1,066	2,919	12,260	436	9,456	47,240	1,502

* Including ribes removed on surveys.

(Continued)

Table 1 Continued

RIBES ERADICATION - 1959

Regions 7 & 8

State Nat'l Forests Nat'l Parks	FIRST WORK Acres	FIRST WORK Ribes *	FIRST WORK Man Days	REWORK Acres	REWORK Ribes *	REWORK Man Days	MAINTENANCE WORK Acres	MAINTENANCE WORK Ribes *	MAINTENANCE WORK Man Days	ALL WORK Acres	ALL WORK Ribes *	ALL WORK Man Days
National Parks												
Acadia - Me.	-	-	-	-	-	-	1	341	1	1	341	1
Saratoga Pk.N.Y	-	-	-	-	-	-	1,450	11,640	49	1,450	11,640	49
Shenandoah Va.	-	-	-	-	-	-	280	1,688	18	280	1,688	18
Total-Nat'l Pks.	-	-	-	-	-	-	1,731	13,669	68	1,731	13,669	68
Ribes Eradication - All Lands												
Maine	482	89,545	285	1,492	139,771	496	1,971	181,424	667	3,945	410,740	1,448
New Hampshire	12	4,523	4	681	302,597	309	609	291,727	226	1,302	598,847	539
Vermont	4,895	71,727	295	3,308	44,796	228	8,945	30,331	223	17,148	146,854	746
Mass.	-	-	-	1,678	14,521	240	111	11,057	18	1,789	25,578	258
Conn.	-	-	-	-	-	-	235	46,871	53	235	46,871	53
New York	5,622	75,826	393	32,891	291,461	1,541	29,159	363,511	1,605	67,672	730,798	3,539
Penna.	70	2,633	14	355	12,455	49	1,139	36,592	269	1,564	51,680	332
Maryland	1,105	138,932	243	862	47,636	166	-	-	-	1,967	186,568	409
W. Va.	509	2,576	71	14,614	79,611	1,953	6,264	13,386	760	21,387	95,573	2,784
Virginia	1,390	2,165	150	4,846	29,277	914	4,524	17,522	591	10,760	48,964	1,655
N.Carolina	469	7,543	59	48	1,340	5	-	-	-	517	8,883	64
Total	14,554	395,470	1,514	60,775	963,465	5,901	52,957	992,421	4,412	128,286	2,351,356	11,827

* Including ribes removed on surveys.

Table 2 **Maintenance Activities**

State	Ownership	Total Acreage Examined	Portion Requiring Intensive Control Measures: Total Acreage Worked	Ribes Destroyed	Man Days	Acres Per Man Days	Ribes Per Acre
Me.	S & P	342,319	1,970	148,778	666	2.9	75.5
Me	Nat'l Park	5,168	1	66	1	1.0	66.0
N. H.	S & P	267,967	609	254,794	226	2.7	418.3
Vt.	S & P	55,258	8,945	30,331	223	18.8	3.4
Mass.	S & P	15,881	111	11,057	18	6.1	100.0
Conn.	S & P	48,354	235	46,871	53	4.4	200.0
N. Y.	S & P	143,736	27,709	351,871	1,556	17.8	12.7
N. Y.	Nat'l Park	1,450	1,450	11,640	49	29.6	8.0
Pa.	S & P	112,253	1,139	36,592	269	4.2	32.0
W.Va.	S & P	66,927	5,449	11,357	641	8.5	2.0
W.Va.	Nat'l Forest	13,415	815	2,029	118	6.9	2.5
Va.	S & P	117,584	2,140	5,758	255	8.3	2.7
Va.	Nat'l Forest	49,718	2,104	10,076	318	6.6	4.8
Va.	Nat'l Park	2,666	280	1,592	18	15.5	5.7
Sub-Total Region 7		1,242,696	52,957	922,812	4,411	12.0	17.0
Tenn.	S & P	200	-	-	2	-	-
N.C.	S & P	3,400	-	-	29	-	-
Sub-Total Region 8		3,600	-	-	31	-	-
All States	S & P	1,173,879	48,307	897,409	3,938	12.2	18.6
	Nat'l Forests	63,133	2,919	12,105	436	6.6	4.1
	Nat'l Parks	9,284	1,731	13,298	68	25.4	7.7
Totals		1,246,296	52,957	922,812	4,442	12.0	17.0

Table 3 Surveys During 1959

State	Ownership	Acreage of Control Area: Examined for Any Purpose	Acreage of Control Area: Mapped	Total Man Days *
Me.	State & Private	448,239	106,112	2,811
Me.	Nat'l Park	5,168	-	54
N. H.	State & Private	373,494	139,634	2,564
N. H.	Nat'l Forest	1,445	1,445	25
Vt.	State & Private	154,040	15,387	601
Mass.	State & Private	59,326	31,790	486
Conn.	State & Private	81,798	33,444	414
N. Y.	State & Private	557,688	156,639	2,233
N. Y.	Nat'l Park	1,450	-	3
Pa.	State & Private	118,190	9,432	513
Md.	State & Private	3,292	1,215	3
W. Va.	State & Private	89,233	2,993	588
W. Va.	Nat'l Forest	15,319	170	52
Va.	State & Private	128,751	1,017	332
Va.	Nat'l Forest	54,327	579	212
Va.	Nat'l Park	2,666	-	53
Sub-Total R-7		2,094,426	499,857	10,944
Tenn.	State & Private	200	-	2
N. C.	State & Private	14,255	544	135
N. C.	Nat'l Forest	555	-	2
Sub-Total R-8		15,010	544	139
Totals	State & Private	2,028,506	498,207	10,682
	Nat'l Forests	71,646	2,194	291
	Nat'l Parks	9,284	-	110
	ALL	2,109,436	500,401	11,083

Table 4 **Chemical Eradication**

State	Ownership	Acres Sprayed	Man Days
Maine	State & Private	3,339	1,315
	Nat'l Park	1	1
New Hampshire	State & Private	841	435
	Nat'l Forest	1	½
Vermont	State & Private	5,605	328
Mass.	State & Private	10	11
Conn.	State & Private	13	17
New York	State & Private	631	457
	Nat'l Park	1 ½	4
Penna.	State & Private	339	98
Maryland	State & Private	380	89
West Va.	State & Private	32	8
Virginia	State & Private	20	1
	Nat'l Forest	110	13
	Nat'l Park	200	12
Sub-Total R-7		11,523 ½	2,789 ½
North Carolina	State & Private	517	64
Sub-Total R-8		517	64
All States		12,040 ½	2,853 ½

Table 5 Local Cooperation On Blister Rust Control

State	No. of Cooperators			Amount Expended			
	Individuals	Towns	Counties	Individuals	Towns	Counties	Total
Me.	1	85	-	$ 194	$ 20,716	$ -	$ 20,910
N. H.	1	86	-	495	19,966	-	20,461
Vt.	-	15	-	-	3,683	-	3,683
Conn.	-	3	-	-	2,341	-	2,341
N. Y.	-	-	17	-	-	21,685	21,685
Md.	1	-	-	222	-	-	222
Total	3	189	17	911	46,706	21,685	69,302

Table 6

Informational & Service Activities - 1959

(Including Area Leaders)

State	Meetings Addressed No.	Meetings Addressed Attendance	Programs Radio & T. V.	No. Items Published	No. Demonstrations Placed	Service Calls	Show-Me Trips	Film Showings No.	Film Showings Attendance
Me.	24	451	-	8	15	*	43	9	915
N. H.	23	888	-	28	7	*	57	5	201
Vt.	2	40	-	27	4	150	-	2	40
Mass.	1	26	-	-	1	46	-	1	26
Conn.	3	850	-	1	1	*	6	-	-
N. Y.	56	2,504	-	47	13	600	71	36	7,377
Pa.	6	335	1	14	2	*	10	29	1,180
Md.	-	-	-	-	-	*	4	-	-
W. Va.	6	141	-	2	5	*	9	5	260
Va.	1	35	-	5	2	*	12	-	-
Sub-Total Region 7	122	5,270	1	132	50	796	212	87	9,999
Tenn.	-	-	-	-	-	-	1	-	-
N. C.	-	-	-	-	-	-	8	-	-
Sub-Total Region 8	-	-	-	-	-	-	9	-	-
Totals	122	5,270	1	132	50	796	221	87	9,999

* Not reported separately.

Table 7

STATUS OF WHITE PINE BLISTER RUST CONTROL
By Land Ownership - Regions 7 & 8
September 30, 1959

State	Owner-ship	NET CONTROL ACREAGE: White Pine	Control Area	% Initial Worked	On Maint-ance	% On Maint-ance	Low Hazard Area	PROJECTED WORKLOAD ACREAGE: 1960	1961	1962	1963	1964
R-7												
Me	S&P	935,220	2,164,546	96.5	1,821,038	84.1	114,460	650,473	119,309	139,628	165,584	139,263
N.H.	"	1,235,227	2,432,320	99.9	2,297,558	94.4	315,232	283,369	139,204	241,769	226,262	222,885
Vt.	"	183,883	728,356	93.0	581,252	79.8	47,247	230,730	20,739	67,931	58,195	33,482
Mass.	"	590,593	1,425,305	99.9	1,369,216	96.0	810,228	218,539	61,207	96,704	47,545	79,287
Conn.	"	106,557	468,208	100.0	468,208	100.0	325,515	25,512	24,794	25,508	26,158	40,721
R. I.	"	64,018	147,778	100.0	147,778	100.0	147,778	Only cursory examinations scheduled				
N. Y.	"	716,151	2,155,211	99.6	1,890,150	87.7	149,659	520,697	394,027	380,232	423,219	277,802
N. J.	"	3,771	16,742	100.0	16,742	100.0	16,742	Only cursory examinations scheduled				
Pa.	"	105,842	469,199	99.1	443,827	94.5	24,306	123,564	80,454	88,910	117,692	59,083
Del.	"	242	6,186	100.0	6,186	100.0	6,186	Only cursory examinations scheduled				
Md.	"	71,224	166,261	100.0	152,444	91.6	54,553	5,240	5,279	1,399	1,716	1,350
W.Va.	"	239,183	489,172	99.7	445,511	91.0	63,699	28,500	4,750	19,950	4,800	28,500
Va.	"	540,456	1,466,324	99.5	1,413,790	96.4	683,753	214,038	96,487	59,839	60,266	74,147
Ky.	"	31,199	114,312	100.0	114,312	100.0	114,282	-	-	-	-	30
R-8												
Tenn.	"	465,679	1,065,663	100.0	1,059,189	99.3	1,042,155	1,000	4,400	450	1,100	1,600
N.C.	"	583,064	1,370,561	99.9	1,364,761	99.5	1,361,790	1,500	1,250	1,000	1,000	1,000
S.C.	"	45,398	77,008	100.0	77,008	100.0	77,008	Only cursory examinations scheduled				
Ga.	"	248,576	324,452	100.0	324,302	99.9	324,302	Only cursory examinations scheduled				
Sub-Total	S&P	6,166,283	15,087,604	99.9	13,993,272	92.7	5,678,895	2,303,162	951,900	1,123,320	1,133,537	959,150

(Continued)

STATUS OF WHITE PINE BLISTER RUST CONTROL

By Land Ownership - Regions 7 & 8

September 30, 1959

State	Ownership	NET CONTROL ACREAGE: White Pine	Control Area	% Initial Worked	On Maintenance	% On Maintenance	Low Hazard Area	PROJECTED WORKLOAD ACREAGE: 1960	1961	1962	1963	1964
					Indian Lands							
R-8												
N.C.	Cherokee	22	445	100.0	445	100.0	445	Only cursory examinations scheduled				
					National Forests							
R-7												
Me.	Wht. Mtn.	914	1,841	100.0	1,841	100.0	-	120	-	603	-	-
N.H.	Wht. Mtn.	1,145	2,494	100.0	2,494	100.0	-	15	100	-	190	-
Vt.	Green Mtn.	544	2,308	100.0	2,308	100.0	-	-	-	322	453	-
Pa.	Allegheny	1,037	4,475	94.6	3,960	88.4	-	-	-	-	4,235	-
W.Va.	Monongh.	47,875	88,894	100.0	83,904	94.3	24,607	16,046	6,258	1,710	10,154	-
W.Va.	Geo.Wash.	42,283	69,538	100.0	61,244	88.0	4,965	13,720	7,262	5,806	6,690	10,466
Va.	Geo.Wash.	191,740	430,005	99.8	397,130	92.3	72,105	49,835	22,388	24,574	47,413	41,563
Va.	Jefferson	63,845	127,336	100.0	123,512	97.0	37,449	14,125	7,154	7,475	10,333	13,130
Ky.	Cumberland	16,980	32,002	100.0	32,002	100.0	31,927	-	-	-	-	75
R-8												
Tenn.	Cherokee	250,171	485,686	100.0	483,164	99.4	481,863	340	1,200	-	-	600
N.C.	N.C. N.F.	136,365	230,947	99.9	227,791	98.6	226,887	500	500	510	100	250
S.C.	Sumter	18,794	53,862	100.0	53,862	100.0	53,862	Only cursory examinations scheduled				
Ga.	Chatta-hoochee	295,902	349,903	100.0	349,713	99.9	349,713	Only cursory examinations scheduled				
Sub-Total	N. F.	1,067,595	1,879,291	99.9	1,822,925	97.0	1,283,378	94,701	44,862	41,000	79,568	66,084

Table 7 Continued

STATUS OF WHITE PINE BLISTER RUST CONTROL
By Land Ownership - Regions 7 & 8
September 30, 1959

Ownership	NET CONTROL ACREAGE: White Pine	Control Area	% Initial Worked	On Maintenance	% On Maintenance	Low Hazard Area	PROJECTED WORKLOAD ACREAGE: 1960	1961	1962	1963	1964
R-7				National Parks							
Acadia, Me	3,500	17,318	100.0	17,318	100.0	-	4,302	-	-	-	-
Saratoga Battle Fld.N.Y	157	1,655	94.0	1,555	94.0	105	100	-	-	-	1,450
Shenandoah-Va.	3,080	14,270	100.0	14,270	100.0	-	2,147	2,265	2,102	2,004	2,105
Blue Ridge-Va.	415	1,780	100.0	343	19.2	-	-	805	-	-	975
R-8											
Blue Ridge-N.C	5,627	11,883	100.0	11,761	98.0	11,761	122	-	-	-	-
Grt.Smoky-N.C.	11,802	30,239	100.0	30,239	100.0	-	None scheduled during period				
Grt.Smoky-Tenn.	54,268	79,752	100.0	79,752	100.0	79,752	Only cursory examinations scheduled				
Sub-Total N.P.	78,849	156,897	99.9	155,238	98.9	91,618	6,671	3,070	2,102	2,004	4,530
Grand Totals	7,312,749	17,124,237	99.1	15,971,880	93.3	7,054,336	2,404,534	999,832	1,166,422	1,215,109	1,029,764

Summarized By Regions and Ownerships

Region 7

State & Private	4,823,566	12,249,920	98.7	11,168,012	91.1	2,873,640	2,300,662	946,250	1,121,870	1,131,437	956,550
Nat'l Forests	366,363	758,893	99.8	708,395	93.3	171,053	93,861	43,162	40,490	79,468	65,834
Nat'l Parks	7,152	35,023	99.7	33,486	95.6	105	6,549	3,070	2,102	2,004	4,530
Sub-Total R-7	5,197,081	13,043,836	98.8	11,909,893	91.3	3,044,798	2,401,072	992,482	1,164,462	1,212,909	1,026,914
State & Private	1,342,717	2,837,684	99.9	2,825,260	99.5	2,805,255	2,500	5,650	1,450	2,100	2,600
Nat'l Forests	701,232	1,120,398	99.9	1,114,530	99.4	1,112,325	840	1,700	510	100	250
Nat'l Parks	71,697	121,874	100.0	121,752	99.8	91,513	122	-	-	-	-
Indian Lands	22	445	100.0	445	100.0	445	-	-	-	-	-
Sub-Total R-8	2,115,668	4,080,401	99.9	4,061,987	99.5	4,009,538	3,462	7,350	1,960	2,200	2,850
Grand Totals	7,312,749	17,124,237	99.1	15,971,880	93.3	7,054,336	2,404,534	999,832	1,166,422	1,215,109	1,029,764

TABLE 8 — BRC COOPERATIVE EXPENDITURES — CALENDAR YEAR — 1959

STATE	FISCAL YEAR	STATE DIRECT AID	INDIVIDUALS	TOWNS	COUNTIES	TOTAL DIRECT AID	INDIRECT AID	TOTAL STATE & LOCAL
ME.	1959	$ 8,660	$ 44	$ 7,607	$ —	$ 16,311	$ 750	$ 17,061
	1960	9,382	150	13,109	—	22,641	325	22,966
TOTAL		18,042	194	20,716	—	38,952	1,075	40,027
N.H.	1959	15,724	188	7,075	—	22,987	498	23,485
	1960	4,575	307	12,891	—	17,773	167	17,940
TOTAL		20,299	495	19,966	—	40,760	665	41,425
VT.	1959	7,030	—	1,837	—	8,867	1,125	9,992
	1960	3,938	—	1,846	—	5,784	60	5,844
TOTAL		10,968	—	3,683	—	14,651	1,185	15,836
MASS.	1959	5,733	—	—	—	5,733	375	6,108
	1960	4,664	—	—	—	4,664	25	4,689
TOTAL		10,397	—	—	—	10,397	400	10,797
CONN	1959	8,740	—	90	—	8,830	225	9,055
	1960	3,463	—	2,251	—	5,714	75	5,789
TOTAL		12,203	—	2,341	—	14,544	300	14,844
N.Y.	1959	85,619	—	—	10,344	95,963	3,585	99,548
	1960	63,775	—	—	11,341	75,116	1,120	76,236
TOTAL		149,394	—	—	21,685	171,079	4,705	175,784
PA.	1959	11,920	—	—	—	11,920	1,980	13,900
	1960	5,504	—	—	—	5,504	660	6,164
TOTAL		17,424	—	—	—	17,424	2,640	20,064
MD.	1959	2,988	222	—	—	3,210	—	3,210
	1960	—	—	—	—	—	—	—
TOTAL		2,988	222	—	—	3,210	—	3,210
W.VA.	1959	11,965	—	—	—	11,965	225	12,190
	1960	12,005	—	—	—	12,005	100	12,105
TOTAL		23,970	—	—	—	23,970	325	24,295
VA.	1959	5,219	—	—	—	5,219	1,425	6,644
	1960	1,066	—	—	—	1,066	475	1,541
TOTAL		6,285	—	—	—	6,285	1,900	8,185
KY.	1959							
	1960							
TOTAL		—	—	—	—	—	—	—
SUB-	1959	163,598	454	16,609	10,344	191,005	10,188	201,193
TOTAL	1960	108,372	457	30,097	11,341	150,267	3,007	153,274
TOTAL	REG 7	271,970	911	46,706	21,685	341,272	13,195	354,467
TENN.	1959							
	1960							
TOTAL	—	—	—	—	—	—	—	—
N.C.	1959	6,660				6,660	400	7,060
	1960							
TOTAL		6,660	—	—	—	6,660	400	7,060
SUB-	1959	6,660	—	—	—	6,660	400	7,060
TOTAL	1960	—						
TOTAL	REG 8	6,660	—	—	—	6,660	400	7,060
TOTALS	1959	170,258	454	16,609	10,344	197,665	10,588	208,253
REG 7&8	1960	108,372	457	30,097	11,341	150,267	3,007	153,274
ALL		278,630	911	46,706	21,685	347,932	13,595	361,527

TABLE 9 — BRC FEDERAL EXPENDITURES — CALENDAR YEAR 1959

STATE FOREST OR PARK	FISCAL YEAR	LANDS	720 LEADERSHIP	411 S & P	042 NAT'L FORESTS	NAT'L PARKS	TOTAL FEDERAL	TOTAL STATE & LOCAL	GRAND TOTAL
					REGION 7				
ME	1959	S & P	$ 19,552	$ 11,856	$ —	$ —	$ 31,408	$ 17,061	$ 48,469
ACADIA		N. P.	107	—	—	—	107	—	107
		N. F.			189		189		189
	1960	S & P	16,295	9,256	—	—	25,551	22,966	48,517
		N. P.	171	—	—	500	671	—	671
	TOTAL	S & P	35,847	21,112			56,959	40,027	96,986
		N. F.			189		189		189
		N. P.	278		—	500	778		778
N.H.	1959	S & P	22,367	18,788	—	—	41,155	23,485	64,640
WHITE MTN		N. F.	56	—	—	—	56	—	56
	1960	S & P	16,026	8,588	—	—	24,614	17,940	42,554
		N. F.	174	—	—	—	174		174
	TOTAL	S & P	38,393	27,376	—	—	65,769	41,425	107,194
		N. F.	230	—	—	—	230	—	230
VT.	1959	S & P	11,704	7,652	—	—	19,356	9,992	29,348
	1960	S & P	6,595	3,246	—	—	9,841	5,844	15,685
	TOTAL		18,299	10,898	—	—	29,197	15,836	45,033
MASS.	1959	S & P	6,871	2,504	—	—	9,375	6,108	15,483
	1960	S & P	5,427	1,318	—	—	6,745	4,689	11,434
	TOTAL		12,298	3,822	—	—	16,120	10,797	26,917
CONN.	1959	S & P	675	889	—	—	1,564	9,055	10,619
	1960	S & P	368	321	—	—	689	5,789	6,478
	TOTAL		1,043	1,210	—	—	2,253	14,844	17,097
N.Y.	1959	S & P	30,903	11,266	—	—	42,169	99,548	141,717
SARATOGA		N. P.	80	—	—	520	600	—	600
	1960	S & P	26,885	13,570			40,455	76,236	116,691
		N. P.	—	—	—	—	—	—	—
[illegible]	TOTAL	S & P	57,788	24,836	—	—	82,624	175,784	258,408
		N. P.	80	—	—	520	600	—	600
PA.	1959	S & P	13,119	2,887			16,006	13,900	29,906
ALLEGHENY		N. F.	69	—	40	—	109	—	109
	1960	S & P	11,095	1,160	—	—	12,255	6,164	18,419
		N. F.	26	—	—	—	26	—	26
	TOTAL	S & P	24,214	4,047	—	—	28,261	20,064	48,325
		N. F.	95	—	40	—	135	—	135
MD.	1959	S & P	794	685		—	1,479	3,210	4,689
	1960	S & P	592	—			592	—	592
	TOTAL		1,386	685		—	2,071	3,210	5,281
WEST VA.	1959	S & P	9,419	5,405			14,824	12,190	27,014
G.W.		N. F.	2,797		1,372		4,169		4,169
MONG		N. F.	3,121		1,717		4,838		4,838
	1960	S & P	8,572	4,307	[illegible]		12,879	12,105	24,984
G.W.		N. F.	3,392		1,454		4,846		4,846
MONG.		N. F.	2,672		2,297		4,969		4,969
	TOTAL	S & P	17,991	9,712		—	27,703	24,295	51,998
		N. F.	11,982	—	6,840	—	18,822	—	18,822

(CONTINUED)

TABLE 9 (CONTINUED) – BRC FEDERAL EXPENDITURES – CALENDAR YEAR 1959

STATE FOREST OR PARK	FISCAL YEAR	LANDS	720 LEADER-SHIP	411 S & P	042 NAT'L FORESTS	NAT'L PARKS	TOTAL FEDERAL	TOTAL STATE & LOCAL	GRAND TOTAL
VA.	1959	S & P	$8,755	$ 3,580	$ - -	$	$ 12,335	$ 6,644	$ 18,979
G.W.		N. F.	4,659		3,860		8,519		8,519
JEFF.		N. F.	2,185		53		2,238		2,238
SHENAN.		N. P.	1,328			2,069	3,397		3,397
BLUE RIDGE		N. P.	26				26		26
VA.	1960	S & P	7,750	324			8,074	1,541	9,615
G.W.		N. F.	3,840		9,308		13,148		13,148
JEFF.		N. F.	2,804		1,488		4,292		4,292
SHENAN.		N. P.	261				261		261
BLUE RDG		N. P.	10				10		10
	TOTAL	S & P	16,505	3,904	–	–	20,409	8,185	28,594
		N. F.	13,488	–	14,709	–	28,197		28,197
		N. P.	1,625	–	–	2,069	3,694		3,694
KY.	1959	S & P	111	–			111		111
CUMB.		N. F.	13				13		13
KY.	1960	S & P	–	–			–		–
CUMB.		N. F.	–				–		–
	TOTAL	S & P	111	–	–	–	111	–	111
		N. F.	13	–	–	–	13	–	13
	1959	S & P	124,270	65,512			189,782	201,193	390,975
		N. F.	12,900		7,231		20,131		20,131
SUBTOTAL		N. P.	1,541			2,589	4,130		4,130
R-7	1960	S.&P.	99,605	42,090			141,695	153,274	294,969
		N. F.	12,908		14,547		27,455		27,455
		N. P.	442			500	942		942
		S & P	223,875	107,602			331,477	354,467	685,944
TOTALS		N. F.	25,808	–	21,778		47,586		47,586
R-7		N. P.	1,983	–	–	3,089	5,072		5,072

REGION – 8

TENN	1959	S & P	661	–			661	–	661
CHEROKEE		N. F.	53				53		53
TENN	1960	S & P	110				110		110
CHEROKEE		N. F.	19				19		19
	TOTAL	S & P	771	–			771	–	771
		N. F.	72	–	–		72		72
N. C.	1959	S & P	2,668	2,500			5,168	7,060	12,228
N.C–N.F.		N. F.	71				71		71
GR. SMOKY		N. P.	13				13		13
BLUE RIDGE		N. P.	50				50		50
N. C.	1960	S & P	791	–			791		791
N.C–N.F.		N. F.	32				32		32
GR. SMOKY		N. P.	6				6		6
BLUE RDG.		N. P.	12				12		12
	TOTAL	S & P	3,459	2,500			5,959	7,060	13,019
		N. F.	103				103		103
		N. P.	81				81		81

(Continued)

TABLE 9 (CONTINUED) – BRC FEDERAL EXPENDITURES – CALENDAR YEAR 1959

STATE FOREST OR PARK	FISCAL YEAR	LANDS	720 LEADER-SHIP	411 S & P	042 NAT'L FORESTS	042 NAT'L PARKS	TOTAL FEDERAL	TOTAL STATE & LOCAL	GRAND TOTAL
	1959	S & P	$ 3,329	$ 2,500	$	$	$ 5,829	$ 7,060	$ 12,889
SUBTOTAL		N. F.	124				124		124
REG. 8		N. P.	63				63		63
	1960	S & P	901				901		901
		N. F.	51				51		51
		N. P.	18				18		18
		S & P	4,230	2,500			6,730	7,060	13,790
TOTAL		N. F.	175	–	–	–	175	–	175
REG-8		N. P.	81	–	–	–	81	–	81
	1959	S & P	127,599	68,012			195,611	208,253	403,864
		N. F.	13,024		7,231		20,255		20,255
ALL		N. P.	1,604			2,589	4,193		4,193
	1960	S & P	100,506	42,090			142,596	153,274	295,870
		N. F.	12,959		14,547		27,506		27,506
		N. P.	460			500	960		960
GRAND TOTAL			256,152	110,102	21,778	3,089	391,121	361,527	752,648

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

ANNUAL REPORT

FOREST PEST CONTROL

NORTH CENTRAL REGION

CALENDAR YEAR 1959

Division of State & Private Forestry
Forest Pest Control Section
In Cooperation With
Federal, State, County and Local Agencies

Milwaukee, Wisconsin
April, 1960

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ANNUAL REPORT

FOREST PEST CONTROL

NORTH CENTRAL REGION

CALENDAR YEAR - 1959

ORGANIZATION

Several changes in the organization of the Forest Pest Control Section were made this year. On April 30 Henry N. Putnam, Section Leader of many years of service, retired and was succeeded by Leonard H. Moore, who formerly headed up the Reforestation Section. George O. Hill, BRC Supervisor (State of Wisconsin) retired on August 1, 1959. On July 1 the national forests in Wisconsin and Michigan assumed full responsibility for all phases of the BRC work on national forest lands. This change was made on the forests in Minnesota in 1958. On July 1 the State of Minnesota took over the full responsibility for work on state and private lands on a reimbursement basis. The States of Ohio, Indiana and Illinois were separated from the Area Leaders' jurisdiction and brought directly under the Regional Office. The accompanying chart shows the Forest Pest Control organization as it existed at the close of the 1959 season.

RESPONSIBILITY

The Section is concerned with cooperative forest pest control work. Under the Lea Act of 1940 and State laws, the Section is responsible for leadership, coordination and technical direction of the blister rust control program on lands of all ownerships. Under the Forest Pest Control Act of 1947 and State laws, the Section is responsible for control work on federal lands, and for cooperating with the States for work on state and private lands. The function of the Section is to help create awareness of forest pest problems and to coordinate and expedite control measures. The Forest Pest Control Act provides for federal financial participation in cooperative forest pest control work when States request it. It is the responsibility of the Section to ascertain the biological and economic aspects of proposed projects by consulting with Forest Experiment Stations and forest managers, submitting project proposals requesting financial aid, drawing up cooperative agreements with the States, assisting them in preparing work plans, and rendering such assistance in the field and elsehwere to assure the successful operation of control projects.

SPREAD OF MAJOR FOREST PESTS IN 1959

White pine blister rust, a two-host parasitic fungus-caused disease, was introduced from Europe about 1900. The disease is now widespread throughout the Region, ranging from very heavy infection in the north to very light in the south. This year infection on pine was found in Chickasaw and Bremer Counties, Iowa for the first time. Blister rust attacks and kills white pines. Damage is particularly severe on young growth, thus threatening the future stands of eastern white pine. The rust is controlled by the destruction of currant and gooseberry bushes (ribes), the alternate hosts for the disease.

Oak wilt is increasing in intensity and is killing oaks, especially the red oak group. Dutch elm disease continues to spread throughout southeastern Wisconsin. To date more than 3500 diseased elms have been found and destroyed. Maple blight, a disease of unknown cause and behavior, is killing hard maple of all age classes on a limited area in northeastern Wisconsin. During the past two years research work has determined that maple is highly susceptible to damage through defoliation, and that the presence of insect activity was probably a major factor in causing the damage. The infection area was not extended this year.

Damage to red pine plantations in Upper Michigan is causing concern. The injury is similar to that caused by Saratoga spittlebug or frost. The Experiment Station is conducting a study to find the cause of the damage.

The spruce budworm infestation in northern Minnesota continues to spread and intensify. In spreading southward it is getting into the major spruce-fir type of the Superior National Forest. Plans have been made to spray about 20,000 acres as a "holding" operation.

The jackpine budworm has intensified in parts of northern Minnesota and Michigan. Harvesting of the large open-grown trees is planned in Upper Michigan to reduce the infestation. The areas in Minnesota are being watched by entomologists to determine whether or not control measures will be necessary in 1960.

After a sharp drop in population due to the severe winter of 1958-59, the European Pine Shoot Moth is again on the increase in Michigan and Wisconsin. Plans have been made to conduct a pilot control operation on the Lower Michigan National Forest in 1960.

Pine sawflies were rather prevalent in 1959 and may increase in 1960.

ACCOMPLISHMENTS IN 1959

The Section's main accomplishments were in the field of white pine blister rust control. However, work on the control of other forest pests were continued.

WHITE PINE BLISTER RUST CONTROL

Control activities were conducted in the three Lake States and in Illinois and Iowa.

Local Control

About 26,000 acres of white pine were protected by destroying 2 million ribes on 56,000 acres of control area at the expense of 11,000 mandays. (Table 2).

Force account labor was used on most of the projects. Prison trusties were used effectively on state and private land in Michigan and Minnesota. Contract eradication again accounted for all work on the Lower Michigan National Forest and for most of the work on the Superior National Forest. The Bureau of Indian Affairs worked 1850 acres by contract. In Michigan 2270 acres of private land were worked by contractors. The average price per acre paid to contractors throughout the Region was $1.77.

The use of 2,4,5-T accounted for the destruction of ribes on 1700 acres of heavy concentrations and swamp areas. All work in Illinois was done by basal stem spraying of 2,4,5-T in oil. Application of 2,4,5-T in water as a foliage spray was made in Michigan, Minnesota and Wisconsin. Power spray equipment was again used to destroy swamp ribes on the Menominee Indian Reservation.

Checking for ribes after eradication showed that satisfactory work was done on 44,349 acres. (Table 2).

Status of Control

The total control problem in the Region consists of 1,323,772 acres of white pine, and 3,821,507 acres of control area. (Table 4). At year's end 86% of the regional control area has been initially worked, and 48% is on maintenance.

The major problem of control is in Michigan, Wisconsin and Minnesota. Nearly all of the natural white pine, and much of the planted is in these States where the rust is most active and prevalent. In Ohio, Indiana and Illinois white pine is extensively planted and grows well, often 4 feet in height per year. Due largely to hot, dry summers and early fall, rust is inhibited, and the danger of rust damage is much less than further north.

On the basis of ownership classes, control work is fairly well on schedule on national forests, and Indian Reservations, but lags on state and county lands, and is far behind on private lands. This is important because of the total control acreage; 61% is private, 26% state, county and municipal, 9% is in national forests, and 4% is in Indian Reservations. (Table 4).

Work Plans

Long-range work plans for national forests, Indian Reservations, and most of the State forests and State parks have been prepared and are being followed. Long-range plans for other state and private lands are being prepared.

Safety

Instruction in safe working practices is a standard part of the field training program. First aid kits are supplied to each field crew and are carried in each government vehicle.

INFORMATIONAL ACTIVITIES

It is the responsibility of this Section to keep the public informed about blister rust and other forest pest control activities. Several radio appearances, talks before forestry classes, newspaper articles, blister rust control movies, show-me trips, and meetings were conducted during 1959. Many personal contacts were made by regular personnel in connection with survey work, and the development of concerted community effort in control work. The major effort is aimed at helping the pine owner help himself. Owners are being encouraged to plant white pine in areas where the rust hazard is low and the white pine weevil is absent.

ECONOMIC STUDY OF WHITE PINE

The economic study of eastern white pine has been completed. The final report is soon to be released by the Washington Office.

RESEARCH STUDIES

Studies of micro-climate effect and the development of rust-resistant white pine are being continued by the Lake States Forest Experiment Station and the University of Wisconsin.

EXPERIMENTAL WORK WITH ANTIBIOTICS

Greater emphasis was given to the testing of antibiotics in hopes that the proper formula and application techniques could be established for treating infected eastern white pine. On the Superior National Forest an area of 30 acres of seedlings, saplings and poles was treated. Concentrations of 200 to 240 ppm. were used on 20 acres of a Cost and Method study area to determine the cost per crop tree treated under local conditions and to test various field procedures. On the remaining 10 acres three concentrations (100, 200 and 300 ppm.) were tested on white pine saplings. The Lake States Experiment Station is testing various concentrations (100, 200, 300, 400 and 800 ppm.) of Acti-dione on the Flambeau River State Forest in Wisconsin. A limited amount of testing of Acti-dione and Phytoactin was done by the BRC leaders. During 1960 checks will be made on all areas treated.

BLISTER RUST CONTROL ON NATIONAL FORESTS

On July 1 the national forests in Wisconsin and Michigan took over the full responsibility for all phases of the BRC program on national forest land. The BRC Area and District Leaders conducted training sessions on each national forest to acquaint the forest personnel with control procedures.

Local Control

Ribes eradication was done on all national forests in the three Lake States. Rework accounted for 70% of the total area covered. Approximately 385,000 ribes were destroyed by 2300 mandays.

Eradication was done by contractors in Michigan and Minnesota on 36% of the total area worked. The average price paid to contractors was $1.80 per acre. (Table 3).

On the Ottawa National Forest 8,970 cankers were pruned from 5,980 infected white pines.

Status of Control

Of the 356,803 acres in the control area, 96% has been worked initially and 76% is now on maintenance. As a result of stocked quadrat surveys and on-the-ground examination of the white pine type, the control area was reduced 4,242 acres. (Table 4).

BLISTER RUST CONTROL ON INDIAN RESERVATIONS

The Bureau of Indian Affairs is responsible for the selection of areas to be protected and the employment of Indian labor and crew leaders. The Forest Service, through the Forest Pest Control Section, has the responsibility of preparing work plans and maps, training of men, checking on adequacy of work, keeping records, and making periodic reports.

Local Control

Ribes eradication continued on four reservations; 57% was maintenance work. About 1300 mandays were used to destroy 424,000 ribes on 3,030 acres of control area. The majority of the work on the Red Lake and Lac Court Oreilles Reservations was done by contract. The average price paid was $3.68 per acre.

Chemical work by power sprayer was continued on the Menominee Reservation where 2,4,5-t was applied at the rate of 1.2 ounces per gallon of water.

Status of Control

Of the 142,499 acres of control area, 97% has been worked initially and 85% is now on maintenance. (Table 4). Most of the pre-maintenance work remaining is on the Menominee, Lac Court Oreilles and Red Lake Reservations.

OTHER FOREST PEST CONTROL WORK

The second cooperative control project with Minnesota was successfully completed for control of the spruce budworm. About 8,000 acres were aerial sprayed and good control was obtained.

Control work on national forests included spraying 2,680 acres for Saratoga spittlebug, 47 acres for red-headed pine sawfly, 53 acres for white pine weevil on jackpine, and 600 acres for jackpine sawfly.

The Forest Pest Control Section maintained close contact with the States, national forest administration and the Experiment Stations to coordinate control work and keep abreast of forest insect and disease conditions.

UNITED STATES FOREST SERVICE
Regional Office Milwaukee, Wisconsin
M. M. NELSON - Regional Forester

STATE DEPARTMENTS of AGRICULTURE AND CONSERVATION

Division of State & Private Forestry
LOUIS C. HERMEL - Chief
Forest Pest Control Section
Leonard H. Moore - Leader
John K. Kroeber - Asst. Leader, Forest Insect Control
S. Daryl Adams - Asst. Leader, Forest Disease Control

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Lansing

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Clerk-Steno. - Shared
With State Dept. of Agri.

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J. N. Licke -
District Leader
Stanley Bilben -
Control Aid

Cable, Wis.

A. W. Depta -
District Leader

Escanaba, Mich.

S. M. Sager -
District Leader

IOWA
Oelwein
R. G. Hayes -
Control Supervisor

Antigo, Wis.
Ray Weber -
District Leader

Traverse City, Mich.
A. J. Verville -
Field Supervisor (A)
Wm. H. Munyon -
Control Aid

NATIONAL FORESTS

Chippewa - Minn.
Superior - Minn.
Chequamegon - Wis.
Nicolet - Wis.
Ottawa - Mich.
Upper Mich. - Mich.
Lower Mich. - Mich.

ILLINOIS
Belvidere
E. D. Bergeson -
Control Supervisor (A)

OHIO
Columbus
No Control Supervisor
Assigned

INDIANA
Indianapolis
No Control Supervisor
Assigned

(A) - Employed on State Funds

Blister Rust Control Organization
December - 1959

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

NORTH CENTRAL REGION

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $532,980,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	16,826	21,855	1,563	40,244	1,156	7,223	29	.18
National Forests	2,745	8,799	985	12,529	385	2,296	31	.18
Bur. Ind. Affairs	795	494	1,741	3,030	424	1,300	140	.43
TOTAL	20,366	31,148	4,289	55,803	1,965	10,819	35	.19

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	176,218	356,803	96.0	75.0	14,201	74,924	267,678
Ind. Reservations	84,594	142,499	96.8	81.9	4,557	21,213	116,729
Non-Fed. Public	400,835	982,522	88.9	46.4	108,965	417,946	455,611
Private	662,125	2,339,683	82.0	42.3	420,221	929,079	990,383
TOTAL	1,323,772	3,821,507	85.7	47.9	547,944	1,443,162	1,830,401

Blister Rust Infection: Infection found on white pine in Chickasaw and Bremer Counties, Iowa. Cumulative: On pines and ribes in all seven states. Most severe in north. Rust found on pines in 211 counties; on ribes in 398 counties of the 622 counties in the seven states in the region.

Nursery Sanitation: 3 state nurseries were worked in Wisconsin. Ribes free zones maintained around 44 nurseries producing about 35,000,000 white pine trees annually.

Canker Pruning: 9,747 cankers removed to save 6,607 infected trees; 436 fatally infected trees were removed.

Surveying: White pine in regional control area was increased this year by 18,809 acres. (See Table 1).

Antibiotic of BR Cankers: 5,000 infected white pines were treated with antibiotics.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

ILLINOIS

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $2,000,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs	631	398	-	1,029	7	30	7	0.03
TOTAL	631	398	-	1,029	7	30	7	0.03

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests							
Ind. Reservations							
Non-Fed. Public	1,672	7,761	98.8	31.9	98	5,187	2,476
Private	1,548	6,820	88.2	38.0	800	3,426	2,594
TOTAL	3,220	14,581	93.8	34.7	898	8,613	5,070

Blister Rust Infection: No additional counties this year. On white pine in 15 counties, on ribes in 30 counties.

Nursery Sanitation: None in 1959.

Canker Pruning: One area treated, one canker removed from 1,000 trees examined.

Surveying: Post-check on 906 acres of control area.

Checking After Eradication: All of the 1,029 worked were checked and found to be satisfactory.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

INDIANA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $7,000,000

LOCAL CONTROL - 1959

NONE

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs								
TOTAL								

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	18	179	100.0	100.0	-	-	179
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	3,169	18,209	95.1	86.3	887	1,599	15,723
Private	7,560	74,196	83.5	68.8	12,213	10,970	51,013
TOTAL	10,747	92,584	85.8	72.3	13,100	12,569	66,915

Blister Rust Infection: No new counties. Cumulative: On white pine in 3 northern counties; on ribes in 53 of the 92 counties in the State.

Nursery Sanitation: None. Cumulative: Ribes-free zones maintained around 3 nurseries.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

IOWA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $5,000,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs	-	65	-	65	2	13	22	0.20
TOTAL	-	65	-	65	2	13	22	0.20

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests							
Ind. Reservations	50	500	100.0	100.0	-	-	500
Non-Fed. Public	627	3,818	100.0	86.8	-	505	3,313
Private	2,485	10,551	95.5	68.5	479	2,845	7,227
TOTAL	3,162	14,869	96.8	74.3	479	3,350	11,040

Blister Rust Infection: Found for the first time on white pine in Chickasaw and Bremer Counties. Cumulative: On white pine in 15 counties in northeastern Iowa, on ribes in 56 of the 99 counties.

Nursery Sanitation: No nursery sanitation performed in 1959. Cumulative: Nine nurseries with protective zones.

Canker Pruning: Eight areas containing 7,875 trees examined. 74 cankers removed from 48 trees. 8 fatally infected trees removed.

Surveying: Five areas containing 14 acres of white pine and 85 acres of control area examined for the first time. 32 areas containing 233 acres of white pine and 1,341 acres of control area that were worked in past years were also examined.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

MICHIGAN

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $185,000,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	7,725	16,885	490	25,100	352	2,986	14	0.12
National Forests	2,350	6,232	70	8,652	120	689	13	0.08
Bur. Ind. Affairs	-	-	-	-	-	-	-	-
TOTAL	10,075	23,117	560	33,752	472	3,675	14	0.11

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	81,567	200,989	98.5	79.0	2,868	39,188	158,933
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	170,094	361,242	90.2	52.5	35,280	136,285	189,677
Private	241,692	763,806	83.9	36.8	123,200	365,039	275,567
TOTAL	493,353	1,326,037	87.8	47.7	161,348	540,512	624,177

Blister Rust Infection: No new counties. Cumulative: On pines in 55 counties; on ribes in all 83 counties in the state. Ribes infection was normal to heavy. Abundance of telial columns noted in September and to middle of October.

Nursery Sanitation: None. Cumulative: Ribes-free zones maintained around 9 nurseries.

Canker Pruning: One plantation in Ottawa National Forest. (See Table 5).

Surveying: 30,356 acres pine and 58,205 acres control area mapped.

Checking After Eradication: All worked area checked except 2,130 acres. All checked acreage was satisfactory.

Ribes Shipping Permits: 106 requests received, 21 canceled, and 64 issued.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

MINNESOTA

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $40,500,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	1,098	1,289	546	2,933	212	1,573	72	0.53
National Forests	230	1,350	-	1,580	85	633	54	0.40
Bur. Ind. Affairs	110	204	208	522	57	261	109	0.50
TOTAL	1,438	2,843	754	5,035	354	2,467	70	0.49

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	47,356	70,383	87.9	63.2	8,483	17,388	44,512
Ind. Reservations	20,683	30,610	96.6	75.8	1,035	6,388	23,187
Non-Fed. Public	60,210	121,740	57.5	16.3	51,782	50,059	19,899
Private	103,358	298,066	69.7	17.0	90,473	156,873	50,720
TOTAL	231,607	520,799	70.9	26.6	151,773	230,708	138,318

Blister Rust Infection: No new counties. Cumulative: On pine in 41 counties, on ribes in 40 of the 87 counties in the State. Rust prevalent in all pine growing counties, especially severe in the northeast.

Nursery Sanitation: None. Cumulative: Ribes free zones maintained around two nurseries.

Canker Pruning: 1 area treated. 36 cankers removed to save 28 trees.

Surveying: Pre-eradication survey of 32 areas added 4,770 acres of which 2,622 acres were white pine. Post-check survey was performed on 18,098 acres of control area and 8,668 acres of white pine; area previously mapped as 17,663 acres of control area including 7,726 acres of white pine. 833 acres examined do not require rework now. As the result of eradication work or post-check survey, 9,923 acres of control area were placed on maintenance.

Antibiotic Use: 4,398 trees treated with antibiotic fungicides.

Checking After Eradication: Of the 5,035 acres worked, 4,217 were checked and meet control standards.

Control Area Permits: 114 applications for currant and gooseberry planting permits received. 106 permits issued. 5 voluntarily canceled. 3 refused.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

OHIO

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $14,000,000

LOCAL CONTROL - 1959

NONE

Operating Agency	Acres Worked				Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop. National Forests Bur. Ind. Affairs								
TOTAL								

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	515	4,029	100.0	100.0	-	-	4,029
Ind. Reservations	-	-	-	-	-	-	-
Non-Fed. Public	8,787	33,693	87.7	63.6	4,131	8,125	21,437
Private	13,414	97,974	94.7	84.6	5,201	9,882	82,891
TOTAL	22,716	135,696	93.1	79.9	9,332	18,007	108,357

Blister Rust Infection: No new counties. **Cumulative:** On pines in 11 counties; on ribes in 65 of the 88 counties in the State.

Nursery Sanitation: None. **Cumulative:** Ribes-free zones maintained around 7 nurseries.

SUMMARY OF WHITE PINE BLISTER RUST CONTROL - DECEMBER 31, 1959

WISCONSIN

ESTIMATED COMMERCIAL VALUE OF WHITE PINE IN CONTROL AREA - $279,480,000

LOCAL CONTROL - 1959

Operating Agency	Acres Worked				Thousands of Ribes Destroyed	Man-Days Used	Per Acre	
	Initial Work	Rework	Maint. Work	Total			Ribes	Man-Days
State - Coop.	7,372	3,218	527	11,117	583	2,621	52	0.24
National Forests	165	1,217	915	2,297	180	974	79	0.42
Bur. Ind. Affairs	685	290	1,533	2,508	367	1,039	146	0.41
TOTAL	8,222	4,725	2,975	15,922	1,130	4,634	71	0.29

STATUS OF CONTROL (NET)

Land Ownership	Control Area		Per Cent		Acres Needing Work		
	Acres of White Pine	White Pine and Protection Zone	Worked Initially	On Maint.	Initial	Rework	Maint.
National Forests	46,762	81,223	96.4	73.9	2,850	18,348	60,025
Ind. Reservations	63,861	111,389	96.8	83.5	3,522	14,825	93,042
Non-Fed. Public	156,276	436,059	96.2	46.6	16,787	216,186	203,086
Private	292,068	1,088,270	82.7	47.8	187,855	380,044	520,371
TOTAL	558,967	1,716,941	87.7	51.1	211,014	629,403	876,524

Blister Rust Infection: Weather conditions (throughout the State) about average for spread of rust despite above normal rainfall. Cumulative: Rust on both white pine and ribes has been found in all 71 counties.

Surveying: Pre-eradication: 2,555 acres of white pine and 12,093 acres of control area. Post-check: 5,774 acres of white pine and 15,338 acres of control area.

Nursery Sanitation: 3 State nurseries worked: Boscobel, Gordon, Hayward. Cumulative: Sanitation zones maintained at 12 nurseries producing about 12,000,000 white pine.

Canker Pruning: One private area treated, removed 666 cankers and 428 trees from 12,353 trees examined.

Control Area Permits: 202 applications received and approval given to 197; three were canceled and 2 refused.

TABLE 1

SURVEYS PERFORMED IN NORTH CENTRAL REGION

Calendar Year 1959

State	Type of Survey	No. of Areas Mapped	Acres Mapped Previously: White Pine	Acres Mapped Previously: Control Area	Total Acres Mapped, Net: White Pine	Total Acres Mapped, Net: Control Area	Mandays Used
Illinois	Pre-eradication	5	-	-	447	906	7
	Post-check	-	-	-	-	-	-
	Total	5	-	-	447	906	7
Iowa	Pre-eradication	5	-	-	14	85	4
	Post-check	32	235	1,346	233	1,341	24
	Total	37	235	1,346	247	1,426	28
Michigan	Pre-eradication	125	120	485	12,885	24,598	122
	Post-check	124	12,455	29,016	17,471	33,607	152
	Total	249	12,575	29,501	30,356	58,205	274
Minnesota	Pre-eradication	32	-	-	2,622	4,770	197
	Post-check	90	7,726	17,663	8,668	18,098	387
	Total	122	7,726	17,663	11,290	22,868	584
Wisconsin	Pre-eradication	57	-	-	2,555	12,093	77
	Post-check	55	5,572	13,578	5,774	15,338	155
	Total	112	5,572	13,578	8,329	27,431	232
Region	Pre-eradication	224	120	485	18,523	42,452	407
	Post-check	301	25,988	61,603	32,146	68,384	718
	Total	525	26,108	62,088	50,669	110,836	1,125

TABLE 2

SUMMARY OF LOCAL CONTROL BY STATES AND OWNERSHIP CLASSES
NORTH CENTRAL REGION - 1959

State	Ownership Class	Workings	Acres		Man Days Used	Thousands of Ribes Destroyed	Acres Checked and Meeting Standard	Contract Eradication	
			White Pine Protected	Control Area Worked				Acres Worked	Average Price Per Acre Paid To Contractor
ILLINOIS	Non-Federal Public	Rework	54	398	21	7	398	-	-
	Private	Initial	288	631	9	0	631	-	-
	Total	All	342	1,029	30	7	1,029	-	-
IOWA	Non-Federal Public	Rework	20	35	7	1	-	-	-
	Private	Rework	27	30	6	1	-	-	-
	Total	All	47	65	13	2	-	-	-
MICHIGAN	National Forests	All	4,497	8,652	689	120	8,452	3,632	1.10
	Non-Federal Public	Initial	2,667	4,675	561	98			
		Rework	4,305	8,020	472	59			
		Maint.	220	490	25	1			
		All	7,192	13,185	1,058	158	12,015	-	-
	Private	Initial	1,131	3,050	635	101			
		Rework	4,104	8,865	1,293	93			
		All	5,235	11,915	1,928	194	11,180	2,270	0.18
	Total	Initial	4,994	10,075	1,320	210			
		Rework	11,640	23,117	2,298	258			
		Maint.	290	560	57	4			
		All	16,924	33,752	3,675	472	31,647	5,902	0.75
MINNESOTA	National Forests	All	1,244	1,580	633	85	1,298	850	4.79
	Indian Reservations	All	90	522	261	57	511	390	8.79
	Non-Federal Public	Initial	588	776	504	64			
		Rework	713	989	704	128			
		Maint.	227	235	4	0			
		All	1,528	2,000	1,212	192	1,882	-	-
	Private	Initial	180	322	203	16			
		Rework	100	300	90	4			
		Maint.	275	311	68	0			
		All	555	933	361	20	526	-	-
	Total	Initial	1,014	1,438	786	90			
		Rework	1,901	2,843	1,503	236			
		Maint.	502	754	178	28			
		All	3,417	5,035	2,467	354	4,217	1,240	
WISCONSIN	National Forests	All	976	2,297	974	180	2,005	-	-
	Indian Reservations	All	1,300	2,508	1,039	367	2,438	1,460	2.31
	Non-Federal Public	Initial	1,088	3,620	523	129			
		Rework	817	2,674	1,508	221			
		Maint.	150	527	205	9			
		All	2,055	6,821	2,236	359	2,246	-	-
	Private	Initial	413	3,752	320	199			
		Rework	51	544	65	25			
		All	464	4,296	385	224	767	-	-
	Total	Initial	1,932	8,222	1,276	377			
		Rework	1,411	4,725	2,466	425			
		Maint.	1,452	2,975	892	328			
		All	4,795	15,922	4,634	1,130	7,456	1,460	2.40
NORTH CENTRAL REGION	National Forests	Initial	1,468	2,745	270	22			
		Rework	4,682	8,799	1,641	334			
		Maint.	567	985	385	29			
		All	6,717	12,529	2,296	385	11,755	4,482	1.80
	Indian Reservations	Initial	405	795	366	48			
		Rework	180	494	494	55			
		Maint.	805	1,741	440	321			
		All	1,390	3,030	1,300	424	2,949	1,850	3.68
	Non-Federal Public	Initial	4,343	9,071	1,588	291			
		Rework	5,909	12,116	2,712	416			
		Maint.	597	1,252	234	10			
		All	10,849	22,439	4,534	717	16,541	-	-
	Private	Initial	2,012	7,755	1,167	316			
		Rework	4,282	9,739	1,454	123			
		Maint.	275	311	68	0			
		All	6,569	17,805	2,689	439	13,104	2,270	0.18
	Region Total	Initial	8,228	20,366	3,391	677			
		Rework	15,053	31,148	6,301	928			
		Maint.	2,244	4,289	1,127	360			
		All	25,525	55,803	10,819	1,965	44,349	8,602	1.77

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TABLE 3

SUMMARY OF LOCAL CONTROL ON FEDERAL LAND
NORTH CENTRAL REGION - 1959

Ownership	National Forest or Indian Reservation	Workings	Acres		Man Days Used	Thousands of Ribes Destroyed	Acres Checked and Meeting Standard	Contract Eradication	
			White Pine Protected	Control Area Worked				Acres Worked	Average Price Per Acre Paid To Contractor
NATIONAL FORESTS	Huron, Michigan	Initial	150	310	16	1			
		Rework	286	692	58	8			
		All	436	1,002	74	9	1,002	1,002	1.48
	Manistee, Michigan	Initial	416	775	24	1			
		Rework	472	1,050	27	12			
		All	888	1,825	51	13	1,625	1,825	0.56
	Hiawatha, Michigan	Rework	-	45	18	6	45	-	-
	Marquette, Michigan	Initial	80	165	30	4			
		Rework	553	1,215	59	9			
		Maint.	70	70	32	3			
		All	703	1,450	121	16	1,450	805	1.86
	Ottawa, Michigan	Initial	550	1,100	54	5			
		Rework	1,920	3,230	371	71			
		All	2,470	4,330	425	76	4,330	-	-
	All National Forests in Michigan	Initial	1,196	2,350	124	11			
		Rework	3,231	6,232	533	106			
		Maint.	70	70	32	3			
		All	4,497	8,652	689	120	8,452	3,632	1.10
	Superior, Minnesota	Initial	176	230	43	7			
		Rework	671	718	377	55			
		All	847	948	420	62	948	850	4.79
	Chippewa, Minnesota	Rework	397	632	213	23	350	-	-
	All National Forests in Minnesota	Initial	176	230	43	7			
		Rework	1,068	1,350	590	78			
		All	1,244	1,580	633	85	1,298	850	4.79
	Chequamegon, Wisconsin	Initial	96	165	103	4			
		Rework	228	692	399	145			
		Maint.	497	915	353	26			
		All	821	1,772	855	175	1,500	-	-
	Nicolet, Wisconsin	Rework	155	525	119	5	505	-	-
	All National Forests in Wisconsin	Initial	96	165	103	4			
		Rework	383	1,217	518	150			
		Maint.	497	915	353	26			
		All	976	2,297	974	180	2,005	-	-
	National Forest Total	Initial	1,468	2,745	270	22			
		Rework	4,682	8,799	1,641	334			
		Maint.	567	985	385	29			
		All	6,717	12,529	2,296	385	11,755	4,482	1.80
INDIAN RESERVATIONS	Red Lake, Minnesota	Initial	70	110	36	3			
		Rework	20	204	119	26			
		Maint.	-	197	103	27			
		All	90	511	258	56	511	390	8.79
	Vermilion, Minnesota	Maint.	-	11	3	1	-	-	-
	All Indian Reservations in Minnesota	Initial	70	110	36	3			
		Rework	20	204	119	26			
		Maint.	-	208	106	28			
		All	90	522	261	57	511	390	8.79
	Lac Court Oreilles, Wis.	Maint.	805	1,533	334	293	1,533	1,460	2.31
	Menominee, Wisconsin	Initial	335	685	330	45			
		Rework	160	290	375	29			
		All	495	975	705	74	905	-	-
	All Indian Reservations in Wisconsin	Initial	335	685	330	45			
		Rework	160	290	375	29			
		Maint.	805	1,533	334	293			
		All	1,300	2,508	1,039	367	2,438	1,460	2.31
	Indian Reservation Total	Initial	405	795	366	48			
		Rework	180	494	494	55			
		Maint.	805	1,741	440	321			
		All	1,390	3,030	1,300	424	2,949	1,850	3.68
ALL FEDERAL	All Federal	Initial	1,873	3,540	636	70			
		Rework	4,862	9,293	2,135	389			
		Maint.	1,372	2,726	825	350			
		All	8,107	15,559	3,596	809	14,704	6,332	2.35

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TABLE 4

STATUS OF CONTROL BY OWNERSHIP CLASSES, NORTH CENTRAL REGION, ON DECEMBER 31, 1959

Ownership	National Forest, Indian Reservation or State	Control Area		Worked Initially			Premaintenance Work Remaining		On Maintenance	
		Acres of White Pine	White Pine and Protection Zone	Acres of White Pine	Acres of Control Area	Percent of Control Area	Initial Work	Rework	Acres of Control Area	Percent of Control Area
NATIONAL FORESTS	Hoosier, Ind.	18	179	18	179	100.0	-	-	179	100.0
	Wayne, Ohio	515	4,029	515	4,029	100.0	-	-	4,029	100.0
	Huron, Mich.	9,116	19,623	8,814	18,923	96.4	700	10,619	8,304	42.3
	Manistee, Mich.	31,930	88,584	31,502	87,596	98.9	988	8,921	78,675	88.8
	Hiawatha, Mich.	15,594	41,159	15,594	41,159	100.0	-	7,013	34,146	83.0
	Marquette, Mich.	11,792	25,890	11,792	25,890	100.0	-	2,548	23,342	90.1
	Ottawa, Mich.	13,135	25,733	12,475	24,553	95.4	1,180	10,087	14,466	56.2
	Superior, Minn.	33,975	47,964	29,359	39,699	82.8	8,265	15,601	24,098	50.2
	Chippewa, Minn.	13,381	22,419	13,289	22,201	99.0	218	1,787	20,414	91.1
	Chequamegon, Wis.	34,078	56,899	32,538	54,049	94.9	2,850	14,127	39,922	70.2
	Nicolet, Wis.	12,684	24,324	12,684	24,324	100.0	-	4,221	20,103	83.0
	All National Forests	176,218	356,803	168,580	342,602	96.0	14,201	74,924	267,678	75.0
INDIAN RESERVATIONS	Sac Fox, Iowa	50	500	50	500	100.0	-	-	500	100.0
	Grand Portage, Minn.	1,097	1,496	1,097	1,496	100.0	-	1,496	-	0.0
	Leech Lake, Minn.	1,094	1,639	1,080	1,596	97.4	43	523	1,073	65.5
	Nett Lake, Minn.	4,888	6,682	4,888	6,682	100.0	-	208	6,474	96.9
	Vermilion, Minn.	78	186	78	186	100.0	-	-	186	100.0
	White Earth, Minn.	675	1,319	601	1,213	92.0	106	548	665	50.4
	Red Lake, Minn.	12,851	19,288	12,313	18,402	95.4	886	3,613	14,789	76.7
	Bad River, Wis.	8,547	15,023	8,451	14,846	98.8	177	1,327	13,519	90.0
	Lac Court Oreilles, Wis.	15,193	27,258	14,115	25,358	93.0	1,900	2,178	23,180	85.0
	Lac du Flambeau, Wis.	14,411	26,001	14,411	26,001	100.0	-	-	26,001	100.0
	Manominee, Wis.	25,710	43,107	24,977	41,662	96.6	1,445	11,320	30,342	70.4
	All Indian Reservations	84,594	142,499	82,061	137,942	96.8	4,557	21,213	116,729	81.9
NON-FEDERAL PUBLIC LAND	Illinois	1,672	7,761	1,670	7,663	98.8	98	5,187	2,476	31.9
	Indiana	3,169	18,209	3,057	17,322	95.1	887	1,599	15,723	86.3
	Iowa	627	3,818	627	3,818	100.0	-	505	3,313	86.8
	Michigan	170,094	361,242	148,400	325,962	90.2	35,280	136,285	189,677	52.5
	Minnesota	60,210	121,740	35,662	69,958	57.5	51,782	50,059	19,899	16.3
	Ohio	8,787	33,693	7.181	29,562	87.7	4,131	8,125	21,437	63.6
	Wisconsin	156,276	436,059	152,059	419,272	96.2	16,787	216,186	203,086	46.6
	All Non-Federal Public Land	400,835	982,522	348,656	873,557	88.9	108,965	417,946	455,611	46.4
PRIVATE LAND	Illinois	1,548	6,820	1,297	6,020	88.2	800	3,426	2,594	38.0
	Indiana	7,560	74,196	6,146	61,983	83.5	12,213	10,970	51,013	68.8
	Iowa	2,485	10,551	2,376	10,072	95.5	479	2,845	7,227	68.5
	Michigan	241,692	763,806	200,804	640,606	83.9	123,200	365,039	275,567	36.8
	Minnesota	103,358	298,066	71,056	207,593	69.7	90,473	156,873	50,720	17.0
	Ohio	13,414	97,974	11,772	92,773	94.7	5,201	9,882	82,891	84.6
	Wisconsin	292,068	1,088,270	249,265	900,415	82.7	187,855	380,044	520,371	47.8
	All Private Land	662,125	2,339,683	542,716	1,919,462	82.0	420,221	929,079	990,383	42.3
TOTAL STATE AND PRIVATE LAND		1,062,960	3,322,205	891,372	2,793,019	84.1	529,186	1,347,025	1,445,994	43.5
TOTAL NORTH CENTRAL REGION		1,323,772	3,821,507	1,142,013	3,273,563	85.7	547,944	1,443,162	1,830,401	47.9
STATUS OF CONTROL BY STATES										
STATUS OF CONTROL BY STATES	Illinois	3,220	14,581	2,967	13,683	93.8	898	8,613	5,070	34.7
	Indiana	10,747	92,584	9,221	79,484	85.8	13,100	12,569	66,915	72.3
	Iowa	3,162	14,869	3,053	14,390	96.8	479	3,350	11,040	74.3
	Michigan	493,353	1,326,037	429,381	1,164,689	87.8	161,348	540,512	624,177	47.7
	Minnesota	231,607	520,799	169,423	369,026	70.9	151,773	230,708	138,318	26.6
	Ohio	22,716	135,696	19,468	126,364	93.1	9,332	18,007	108,357	79.9
	Wisconsin	558,967	1,716,941	508,500	1,505,927	87.7	211,014	629,403	876,524	51.1

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TABLE 5

CURRENT AND CUMULATIVE CANKER PRUNING
NORTH CENTRAL REGION

FROM INCEPTION TO DECEMBER 31, 1959

State	Ownership Class	No. of Areas Treated	Number of Trees			No. of Cankers Removed	Mandays Used
			Examined	Removed	Treated		
Illinois	State	1	1,000	-	1	1	1
Iowa	State	8	7,875	8	48	74	8
Michigan	Nat. For.	1	78,000	-	5,980	8,970	50
Minnesota	State	1	100	-	28	36	2
Wisconsin	State	1	12,353	428	550	666	31
Regional Totals	All	12	99,328	436	6,607	9,747	92
			Cumulative to December 31, 1959				
Illinois	All	2	4,000	-	1	4	2
Indiana	All	4	973	-	8	11	1
Iowa	All	107	95,267	1,241	1,240	2,682	142
Michigan	All	404	955,976	2,770	68,641	135,968	4,162
Minnesota	All	220	563,505	9,068	56,017	94,294	2,408
Ohio	All	5	1,306	13	44	126	15
Wisconsin	All	32	518,607	7,647	43,222	55,564	813
Regional Totals		774	2,139,634	20,739	169,173	288,649	7,543

TABLE 6

NURSERY SANITATION PERFORMED
NORTH CENTRAL REGION 1959
(All Wisconsin)

Ownership and Name of Nursery	Working	White Pine Trees in Nursery (Thousands)	Acres Protected	Acres in Sanitation Zone	Ribes Destroyed	Mandays Used
Boscobel (State)	6	5,500	130	600	611	11
Gordon (State)	16	820	40	413	1,457	50
Hayward (State)	16	4,447	100	572	5,102	40
Total	-	10,767	270	1,585	7,170	101

TABLE 7

EXPENDITURES, NORTH CENTRAL REGION, CALENDAR YEAR 1959
BY STATE AND SOURCE OF FUNDS

Source of Funds	ILLINOIS	IOWA	MICHIGAN	MINNESOTA	WISCONSIN	REGIONAL OFFICE	TOTAL
State Indirect Aid							
January - June	$210	$500	$675	$1,750	$8,100	-	$11,235
July - December	210	500	675	-	8,100	-	9,485
State Direct Aid							
January - June	3,898	-	18,315	7,259	18,794	-	48,266
July - December	4,339	107	29,828	9,991	28,915	-	73,180
Sub-Total, State	8,657	1,107	49,493	19,000	63,909	-	142,166
Forest Service - 720							
January - June	537	2,018	12,977	11,384	16,163	16,219	59,298
July - December	-	2,132	11,904	8,986	13,246	15,717	51,985
Forest Service - 411							
January - June	884	120	12,297	5,609	6,435	1,650	26,995
July - December	-	-	11,583	7,216	10,567	2,670	32,036
National Forests - 042							
January - June	-	-	9,407	8,709	4,735	8,089	30,940
July - December	-	-	3,991	13,694	13,523	3,996	35,204
Bur. Indian Affairs							
January - June	-	-	-	5,961	7,760	-	13,721
July - December	-	-	-	4,240	2,737	-	6,977
Sub-Total, Federal	1,421	4,270	62,159	65,799	75,166	48,341	257,156
All Funds							
January - June	5,529	2,638	53,671	40,672	61,987	25,958	190,455
July - December	4,549	2,739	57,981	44,127	77,088	22,383	208,867
Region Total	10,078	5,377	111,652	84,799	139,075	48,341	399,322

TABLE 7 A
EXPENDITURES BY ACTIVITY AND STATE

State or Source of Funds	Program Planning Direction	Surveys and Checking	Ribes Eradication	Nursery Protection	Canker Pruning	Methods Studies	Educational Work	Total
Illinois	2,500	500	2,948	-	30	500	3,600	10,078
Iowa	2,950	1,100	427	300	400	-	200	5,377
Michigan	9,394	17,372	83,886	-	-	-	1,000	111,652
Minnesota	11,843	20,929	43,597	-	60	6,470	1,900	84,799
Wisconsin	9,800	14,313	95,976	1,490	396	14,900	2,200	139,075
Regional Office	43,341	-	-	-	-	3,000	2,000	48,341
Region Total	79,828	54,214	226,834	1,790	886	24,870	10,900	399,322

TABLE 7 B
EXPENDITURES BY ACTIVITY AND SOURCE OF FUNDS

State Indirect Aid	5,400	-	-	300	-	14,400	620	20,720
State Direct Aid	2,463	16,859	93,544	798	402	3,200	4,180	121,446
Forest Service - 720	54,893	18,000	28,340	76	424	4,550	5,000	111,283
Forest Service - 411	3,920	9,008	44,937	616	60	290	200	59,031
National Forest - 042	13,152	6,748	42,914	-	-	2,430	900	66,144
Bur. of Indian Affairs	-	3,599	17,099	-	-	-	-	20,698
Region Total	79,828	54,214	226,834	1,790	886	24,870	10,900	399,322
Percent Each Activity	19.9	13.6	56.9	0.4	0.2	6.2	2.8	100.0

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